www.wackergroup.com

0158576en	001
0704	

Ride-On Trowels

CRT 36-23K-H
CRT 48-25K-L
CRT 48-25K-H
CRT 36-24A
CRT 48-31V
CRT 48-31V-ES

REPAIR MANUAL

1. Foreword 3

2. Safety Information 6

2.1 Operating Safety 7
2.2 Operator Safety while using Internal Combustion Engines 8
2.3 Service Safety 9

3. Technical Data 10

3.1 Kohler Engine 10
3.2 Honda Engine 12
3.3 Vanguard Engine (manual steer) 14
3.4 Vanguard Engine (electric steer) 16

4. General 18

4.1 Features and Controls-Kohler or Honda Engine 18
4.2 Features and Controls-Vanguard Engine (manual steer) 20
4.3 Features and Controls-Vanguard Engine (electric steer) 22
4.4 Transporting Trowels 24
4.5 Wheel Kit - 0150397 25
4.6 Wheel Kit - 0154750 27
4.7 Wheel Kit - 0160259 28

5. Drive Line 30

5.1 Belt Replacement 30
5.2 Belt Adjustment 31
5.3 Drive Line Exploded View 32
5.4 Drive Line Teardown and Rebuild 33

6. Gearbox and Spider 34

6.1 Gearbox Basics 34
6.2 Gearbox Removal and Installation 35
6.3 Spider Removal and Installation 37
6.4 Lift Ring Disassembly and Assembly 40
6.5 Gearbox Disassembly 42
6.6 Gearbox Assembly 44

7. Steering and Pitch Control 45

7.1 Removal and Installation of Manual Steering Yokes 45
7.2 Adjustment of Manual Steering 49
7.3 Pitch Control Removal and Installation 50
7.4 Removal and Installation of Electric Steering Load Pins 52
7.5 Removal and Installation of Electric Steering Actuators 54
7.6 Removal and Installation of Electric Steering Joysticks 55
7.7 Removal and Installation of Electric Steer Control Board 56
7.8 Electric Steer Error Code Diagnostics and Troubleshooting 58
7.9 Error Code 111 - Right Actuator Fault 60
7.10 Error Code 121 - Side Actuator Fault 62
7.11 Error Code 131 - Left Actuator Fault 64
7.12 Error Code 211 - Right Load Pin Open Circuit 66
7.13 Error Code 212 - Right Load Pin Short Circuit 66
7.14 Error Code 221 - Side Load Pin Open Circuit 67
7.15 Error Code 222 - Side Load Pin Short Circuit 68
7.16 Error Code 231 - Left Load Pin Open Circuit 69
7.17 Error Code 232 - Left Load Pin Short Circuit 70
7.18 Error Code 311 - Right Joystick Open Circuit 71
7.19 Error Code 312 - Right Joystick Short Circuit 72
7.20 Error Code 321 - Left Joystick Open Circuit 73
7.21 Error Code 322 - Left Joystick Short Circuit 74
7.22 Error Code 414 - Control Board Over Temperature 75
7.23 Error Code 415 - Low Battery Voltage 75

8. Engine 76

8.1 Engine Removal and Installation-Kohler or Honda Engine 76
8.2 Engine Removal and Installation-Vanguard Engine 79
8.3 Wiring Schematic-Kohler 82
8.4 Wiring Schematic-Honda 86
8.5 Wiring Schematic-Vanguard Engine (manual steer) 90
8.6 Wiring Schematic-Vanguard Engine (electric steer) 92

CALIFORNIA

Proposition 65 Warning:

Engine exhaust, some of its constituents, and certain vehicle components contain or emit chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

1. Foreword

This manual provides information and procedures to safely operate and maintain this Wacker model. For your own safety and protection from injury, carefully read, understand and observe the safety instructions described in this manual.

Keep this manual or a copy of it with the machine. If you lose this manual or need an additional copy, please contact Wacker Corporation. This machine is built with user safety in mind; however, it can present hazards if improperly operated and serviced. Follow operating instructions carefully! If you have questions about operating or servicing this equipment, please contact Wacker Corporation.

The information contained in this manual was based on machines in production at the time of publication. Wacker Corporation reserves the right to change any portion of this information without notice.

All rights, especially copying and distribution rights, are reserved.

Copyright 2004 by Wacker Corporation.

No part of this publication may be reproduced in any form or by any means, electronic or mechanical, including photocopying, without express written permission from Wacker Corporation.

Any type of reproduction or distribution not authorized by Wacker Corporation represents an infringement of valid copyrights and will be prosecuted. We expressly reserve the right to make technical modifications, even without due notice, which aim at improving our machines or their safety standards.

Notes:

This manual covers machines with Item Number:

0009083, 0009084, 0009085, 0009086, 0009216
0009232, 0009481, 0009482, 0009483

Operating / Parts Information

You must be familiar with the operation of this machine before you attempt to troubleshoot or make any repairs to it. Basic operating and maintenance procedures are described in the operator's manual supplied with the machine. Keep a copy of it with the machine at all times. Use the separate parts manual supplied with the machine to order replacement parts. If either of the manuals becomes lost, please contact Wacker Corporation to order a replacement.

Damage caused by misuse or neglect of the unit should be brought to the attention of the operator, to prevent similar occurrences from happening in the future.

This manual provides information and procedures to safely repair and maintain the above Wacker model(s). For your own safety and protection from injury, carefully read, understand, and observe all instructions described in this manual. THE INFORMATION CONTAINED IN THIS MANUAL IS BASED ON MACHINES MANUFACTURED UP TO THE TIME OF PUBLICATION. WACKER CORPORATION RESERVES THE RIGHT TO CHANGE ANY PORTION OF THIS INFORMATION WITHOUT NOTICE.

2. Safety Information

This manual contains DANGER, WARNING, CAUTION, and NOTE callouts which must be followed to reduce the possibility of personal injury, damage to the equipment, or improper service.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION: Used without the safety alert symbol, CAUTION indicates a potentially hazardous situation which, if not avoided, may result in property damage.

Note: *Contains additional information important to a procedure.*

2.1 Operating Safety

Familiarity and proper training are required for the safe operation of equipment! Equipment operated improperly or by untrained personnel can be dangerous! Read the operating instructions contained in both this manual and the engine manual and familiarize yourself with the location and proper use of all controls. Inexperienced operators should receive instruction from someone familiar with the equipment before being allowed to operate the machine.

2.1.1 NEVER operate this machine in applications for which it is not intended.

2.1.2 NEVER allow anyone to operate this equipment without proper training. People operating this equipment must be familiar with the risks and hazards associated with it.

2.1.3 NEVER touch the engine or muffler while the engine is on or immediately after it has been turned off. These areas get hot and may cause burns.

2.1.4 NEVER use accessories or attachments that are not recommended by Wacker. Damage to equipment and injury to the user may result.

2.1.5 NEVER operate the machine with the beltguard missing. Exposed drive belt and pulleys create potentially dangerous hazards that can cause serious injuries.

2.1.6 NEVER leave machine running unattended.

2.1.7 DO NOT run machine indoors or in an enclosed area such as a deep trench unless adequate ventilation, through such items as exhaust fans or hoses, is provided. Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death.

2.1.8 ALWAYS remain aware of moving parts and keep hands, feet, and loose clothing away from moving parts of equipment.

2.1.9 ALWAYS keep hands, feet, and loose clothing away from moving parts of the machine.

2.1.10 ALWAYS wear protective clothing appropriate to the job site when operating equipment.

2.1.11 ALWAYS read, understand, and follow procedures in Operator's Manual before attempting to operate equipment.

2.1.12 ALWAYS be sure operator is familiar with proper safety precautions and operation techniques before using machine.

2.1.13 ALWAYS close fuel valve on engines equipped with one when machine is not being operated.

2.1.14 ALWAYS store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children.

2.1.15 ALWAYS operate machine with all safety devices and guards in place and in working order.

2.2 Operator Safety while using Internal Combustion Engines

DANGER

Internal combustion engines present special hazards during operation and fueling! Read and follow warning instructions in engine owner's manual and safety guidelines below. Failure to follow warnings and safety guidelines could result in severe injury or death.

2.2.1 DO NOT run machine indoors or in an enclosed area such as a deep trench unless adequate ventilation, through such items as exhaust fans or hoses, is provided. Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death.

2.2.2 DO NOT smoke while operating machine.

2.2.3 DO NOT smoke when refueling engine.

2.2.4 DO NOT refuel hot or running engine.

2.2.5 DO NOT refuel engine near open flame.

2.2.6 DO NOT spill fuel when refueling engine.

2.2.7 DO NOT run engine near open flames.

2.2.8 ALWAYS refill fuel tank in well-ventilated area.

2.2.9 ALWAYS replace fuel tank cap after refueling.

2.2.10 ALWAYS keep area around muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite them, starting a fire.

2.3 Service Safety

WARNING

Poorly maintained equipment can become a safety hazard! In order for the equipment to operate safely and properly over a long period of time, periodic maintenance and occasional repairs are necessary.

2.3.1 DO NOT attempt to clean or service machine while it is running. Rotating parts can cause severe injury.

2.3.2 DO NOT crank a flooded engine with the spark plug removed on gasoline-powered engines. Fuel trapped in the cylinder will squirt out the spark plug opening.

2.3.3 DO NOT test for spark on gasoline-powered engines, if engine is flooded or the smell of gasoline is present. A stray spark could ignite fumes.

2.3.4 DO NOT use gasoline or other types of fuels or flammable solvents to clean parts, especially in enclosed areas. Fumes from fuels and solvents can become explosive.

2.3.5 ALWAYS handle blades carefully. The blades can develop sharp edges which can cause serious cuts.

2.3.6 ALWAYS keep area around muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite them, starting a fire.

2.3.7 ALWAYS replace worn or damaged components with spare parts designed and recommended by Wacker.

2.3.8 ALWAYS disconnect spark plug on machines equipped with gasoline engines, before servicing, to avoid accidental start-up.

2.3.9 ALWAYS switch off the power supply at the battery disconnect before adjusting or maintaining the electrical equipment.

2.3.10 ALWAYS keep machine clean and labels legible. Replace all missing and hard-to-read labels. Labels provide important operating instructions and warn of dangers and hazards.

3. Technical Data

3.1 Kohler Engine

Part No.		**CRT 48** 0009084, 0009085	**CRT 36** 0009083
Engine			
Engine Make		Kohler	Kohler
Engine Model		CH25	CH23
Rated Power	kW (Hp)	18.6 (25)	17.2 (23)
Displacement	cm^3 (in^3)	725 (44)	674 (41)
Spark Plug		Champion RC12YC	
Electrode Gap	mm (in.)	0.76 (0.030)	
Engine Speed - full load	rpm	4000	
Engine Speed - idle	rpm	1200	
Battery	V / size	12 / 340CCA	
Fuel	type	Regular unleaded gasoline	
Fuel Tank Capacity	l (gal.)	24.6 (6.5)	
Fuel Consumption	l (qt.)/hr.	7.6 (8.0)	
Running Time	hrs.	3.3	
Clutch	type	variable speed	
Low Oil Shutdown		yes	
Engine Oil Capacity	l (qt.)	2 (2.1)	
Engine Lubrication	oil grade	SAE 10W30 API CF-4, CF, SJ	

Part No.		**CRT 48** 0009084, 0009085	**CRT 36** 0009083
Trowel			
Operating Weight	kg (lbs.)	430 (945)	383 (845)
Dimensions (L x W x H)	mm (in.)	2665 x 1395 x 1330 (105 x 55 x 52)	2170 x 1170 x 1330 (86 x 46 x 52)
Rotor Speed (range)	rpm	CRT48-25K-L: 35-120 CRT48-25K-H: 25-150	35-150
Blade Pitch (range)	degrees	0-25	
Gearbox		heavy duty, fan cooled	heavy duty
Gearbox Lubrication*	l (oz.)	1.83 (62) each	
Driveshaft	type	splined universal joint	

*Use only Mobil Oil SHC634 synthetic oil.

Operation			
Troweling Width **with pans** (non-overlapping) **without pans** (overlapping)	mm (in.)	 2464 (97) 2515 (99)	 1945 (77) 2020 (80)
Troweling Area **with pans** (non-overlapping) **without pans** (overlapping)	m^2 (ft^2)	 3 (32) 3.2 (34)	 1.8 (19) 2 (22)

3.2 Honda Engine

Part No.		CRT 36A 0009232	CRT 36A-E 0009483
Engine			
Engine Make		Honda	
Engine Model		GX670	
Rated Power	kW (Hp)	17.9 (24)	
Displacement	cm^3 (in^3)	670 (41)	
Spark Plug		NGK ZGR5A DENSO J16CR-U	
Electrode Gap	mm (in.)	0.70 (0.028)	
Engine Speed - full load	rpm	3850	
Engine Speed - idle	rpm	1400	
Battery	V / size	12 / 340CCA	
Fuel	type	Regular unleaded gasoline	
Fuel Tank Capacity	l (gal.)	24.6 (6.5)	
Fuel Consumption	l (qt.)/hr.	9 (9.5)	
Running Time	hrs.	2.7	
Clutch	type	variable speed	
Low Oil Shutdown		yes	
Engine Oil Capacity	l (qt.)	1.9 (2.0)	
Engine Lubrication	oil grade	SAE 10W30 API CF-4, CF, SJ	

Part No.		CRT 36A 0009232	CRT 36A-E 0009483
Trowel			
Operating Weight	kg (lbs.)	410 (905)	
Dimensions (L x W x H)	mm (in.)	2170 x 1170 x 1330 (86 x 46 x 52)	2032 x 1170 x 1320 (80 x 46 x 52)
Rotor Speed (range)	rpm	35-150	
Blade Pitch (range)	degrees	0-25	
Gearbox		heavy duty	
Gearbox Lubrication*	l (oz.)	1.83 (62) each	
Driveshaft	type	splined universal joint	

*Use only Mobil Oil SHC634 synthetic oil.

Operation			
Troweling Width **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	mm (in.)	1975 (78) 2020 (80) --	1975 (78) -- 1905 (75)
Troweling Area **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	m^2 (ft^2)	1.8 (19) 2.0 (22) --	1.8 (19) -- 1.6 (18)

3.3 Vanguard Engine (manual steer)

Part No.		**CRT 48-31V** 0009086	**CRT 48-31V-E** 0009481
Engine			
Engine Make		Vanguard	
Engine Model		DM950G	
Rated Power	kW (Hp)	23.1 (31)	
Displacement	cm^3 (in^3)	950 (58)	
Spark Plug	type	Champion RC12YC	
Electrode Gap	mm (in.)	0.76 (0.030)	
Engine Speed - full load	rpm	4000	
Engine Speed - idle	rpm	1500	
Battery	V / size	12 / BCI G24	
Fuel	type	Regular unleaded gasoline	
Fuel Tank Capacity	l (gal.)	24.6 (6.5)	
Fuel Consumption	l (gal.)/hr.	10 (2.6)	
Running Time	hrs.	2.5	
Clutch	type	variable speed	
Low Oil Shutdown		yes	
Engine Oil Capacity	l (qt.)	3.3 (3.5)	
Engine Lubrication	oil grade	SAE 10W30 SH, SJ	

Part No.		CRT 48-31V 0009086	CRT 48-31V-E 0009481
Trowel			
Operating Weight	kg (lbs.)	562 (1240)	
Dimensions (L x W x H)	mm (in.)	2665 x 1395 x 1330 (105 x 55 x 52)	2530 x 1397 x 1328 (100 x 55 x 52)
Rotor Speed (range)	rpm	25-150	
Blade Pitch (range)	degrees	0-25	
Gearbox		heavy duty, fan cooled	
Gearbox Lubrication*	l (oz.)	1.83 (62) each	
Driveshaft	type	splined universal joint	

*Use only Mobil Oil SHC634 synthetic oil.

Operation			
Troweling Width **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	mm (in.)	2465 (97) 2515 (99) --	2465 (97) -- 2413 (95)
Troweling Area **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	m^2 (ft^2)	3 (32) 3.2 (34) --	3 (32) -- 2.8 (30)

3.4 Vanguard Engine (electric steer)

Part No.		CRT 48-31V-ES 0009216	CRT 48-31V-ES-E 0009482
Engine			
Engine Make		Vanguard	
Engine Model		DM950G	
Rated Power	kW (Hp)	23.1 (31)	
Displacement	cm^3 (in^3)	950 (58)	
Spark Plug	type	Champion RC12YC	
Electrode Gap	mm (in.)	0.76 (0.030)	
Engine Speed - full load	rpm	4000	
Engine Speed - idle	rpm	1500	
Battery	V / size	12 / Group 24	
Fuel	type	Regular unleaded gasoline	
Fuel Tank Capacity	l (gal.)	24.6 (6.5)	
Fuel Consumption	l (gal.)/hr.	10 (2.6)	
Running Time	hrs.	2.5	
Clutch	type	variable speed	
Low Oil Shutdown		yes	
Engine Oil Capacity	l (qt.)	3.3 (3.5)	
Engine Lubrication	oil grade	SAE 10W30 SH, SJ	
Driveshaft	type	splined universal joint	

Part No.		**CRT 48-31V-ES** 0009216	**CRT 48-31V-ES-E** 0009482
Trowel			
Operating Weight	kg (lbs.)	528 (1165)	
Dimensions (L x W x H)	mm (in.)	2665 x 1395 x 1330 (105 x 55 x 52)	2530 x 1397 x 1328 (100 x 55 x 52)
Rotor Speed (range)	rpm	25-150	
Blade Pitch (range)	degrees	0-25	
Gearbox		heavy duty, fan cooled	
Gearbox Lubrication*	l (oz.)	1.83 (62) each	

*Use only Mobil Oil SHC634 synthetic oil.

Operation			
Troweling Width **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	mm (in.)	2465 (97) 2515 (99) --	2465 (97) -- 2413 (95)
Troweling Area **with pans** (non-overlapping) **without pans** (overlapping) **without pans** (non-overlapping)	m^2 (ft^2)	3 (32) 3.2 (34) --	3 (32) -- 2.8 (30)

4. General

4.1 Features and Controls-Kohler or Honda Engine

See Graphic: wc_gr000142

Control locations and functions:

a	right pitch control	**m**	work light (one each side)
b	water tank	**n**	foot pedal (throttle control)
c	control arms	**o**	engine choke control
d	operator's seat with "operator presence" switch	**q**	work light switch
e	left pitch control	**r**	DC accessory outlet
f	rear work light (one each side)	**s**	engine keyswitch
g	control panel (one each side)	**t**	hour meter
h	fuel tank	**u**	water spray control

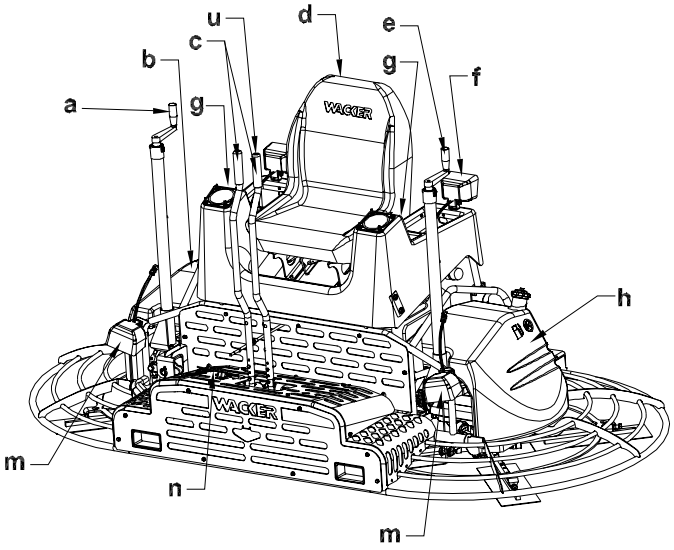
The Riding Trowel features a seat with an integrated "operator presence" system, which works in conjunction with a throttle mounted switch. This system allows the engine to remain running (idling) with no operator seated in the seat, as long as the throttle is not depressed. This system meets all safety requirements and eliminates the need for a foot-operated "kill switch".

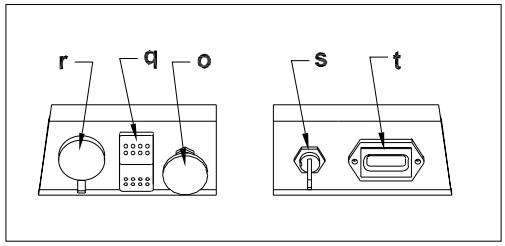
To familiarize a new operator with the Riding Trowel the following steps should be taken:

4.1.1 With the operator in the seat, show him or her the functions of the control arms **(c)** and how to start the machine.

4.1.2 Have the operator practice steering the trowel. A hard concrete slab slightly wetted with water is an ideal place for an operator to practice with the machine. For this practice, pitch the blades up approximately ¼" on the leading edge. Start by making the machine hover in one spot, and then practice driving the machine in a straight line and making 180° turns. The **best control** is achieved at full rpm.

Kohler or Honda Engine





wc_gr000142

4.2 Features and Controls-Vanguard Engine (manual steer)

See Graphic: wc_gr000250

Control locations and functions:

a	right pitch control	**o**	engine choke control
b	water tank	**q**	work light switch
c	control arms	**r**	DC accessory outlet
d	operator's seat with "operator presence" switch	**s**	engine keyswitch
e	left pitch control	**t**	hour meter
f	rear work light (one each side)	**u**	water spray control
g	control panel	**v**	oil pressure indicator light
h	fuel tank	**w**	alternator charging indicator light
m	work light (one each side)	**x**	coolant temperature indicator light
n	foot pedal (throttle control)		

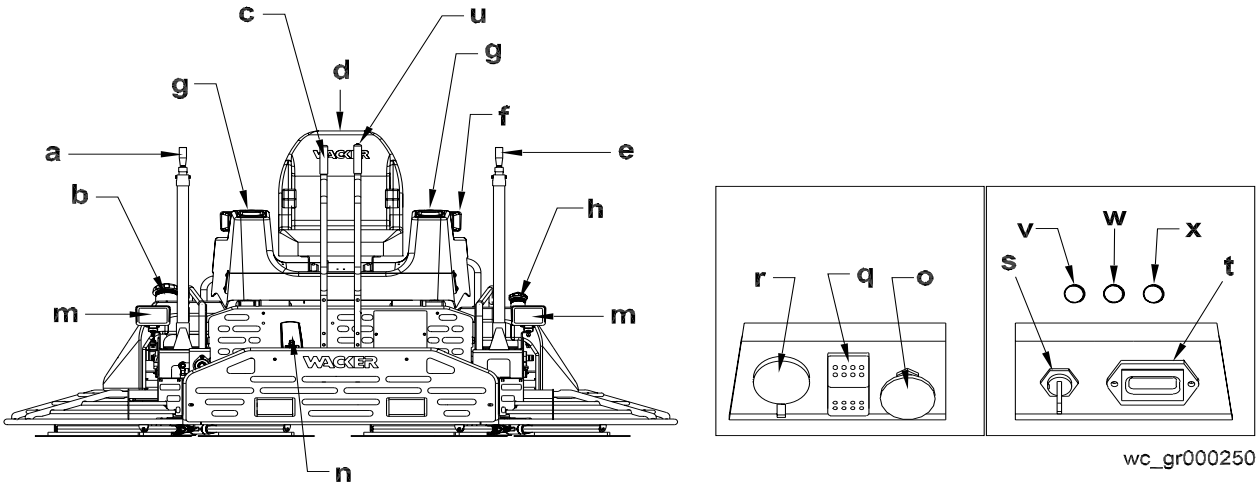
The Riding Trowel features a seat with an integrated "operator presence" system, which works in conjunction with a throttle mounted switch. This system allows the engine to remain running (idling) with no operator seated in the seat, as long as the throttle is not depressed. This system meets all safety requirements and eliminates the need for a foot-operated "kill switch".

To familiarize a new operator with the Riding Trowel the following steps should be taken:

4.2.1 With the operator in the seat, show him or her the functions of the control arms **(c)** and how to start the machine.

4.2.2 Have the operator practice steering the trowel. A hard concrete slab slightly wetted with water is an ideal place for an operator to practice with the machine. For this practice, pitch the blades up approximately ¼" on the leading edge. Start by making the machine hover in one spot, and then practice driving the machine in a straight line and making 180° turns. The **best control** is achieved at full rpm.

Vanguard Engine (manual steer)



4.3 Features and Controls-Vanguard Engine (electric steer)

See Graphic: wc_gr000696

Ref.	Description	Ref.	Description
a	right pitch control	**q**	work light switch
b	water tank	**r**	DC accessory outlet
c	joystick	**s**	engine keyswitch
d	operator's seat with "operator presence" switch	**t**	hour meter
e	left pitch control	**u**	water spray control
f	rear work light (one each side)	**v**	oil pressure indicator light
g	control panel	**w**	alternator charging indicator light
h	fuel tank	**x**	coolant temperature indicator light
m	work light (one each side)	**y**	status OK indicator light (green)
n	foot pedal (throttle control)	**z**	status error indicator light (red)
o	engine choke control		

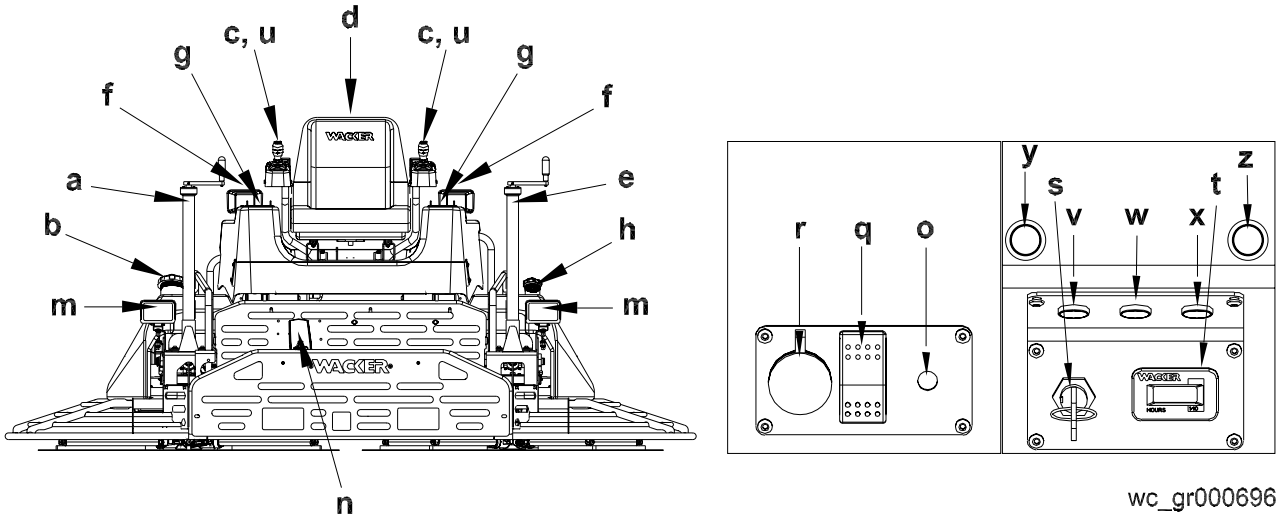
The Riding Trowel features a seat with an integrated "operator presence" system, which works in conjunction with a throttle mounted switch. This system allows the engine to remain running (idling) with no operator seated in the seat, as long as the throttle is not depressed. This system meets all safety requirements and eliminates the need for a foot-operated "kill switch".

To familiarize a new operator with the Riding Trowel the following steps should be taken:

4.3.1 With the operator in the seat, show him or her the functions of the joysticks **(c)** and how to start the machine.

4.3.2 Have the operator practice steering the trowel. A hard concrete slab slightly wetted with water is an ideal place for an operator to practice with the machine. For this practice, pitch the blades up approximately ¼" on the leading edge. Start by making the machine hover in one spot, and then practice driving the machine in a straight line and making 180° turns. The **best control** is achieved at full rpm.

Vanguard Engine (electric steer)



wc_gr000696

4.4 Transporting Trowels

See Graphic: wc_gr000144

To lift the trowel with a fork lift:

Fork lift pockets **(a)** are provided on both the front and back of the machine. Carefully run the fork lift's forks into either set of fork lift pockets.

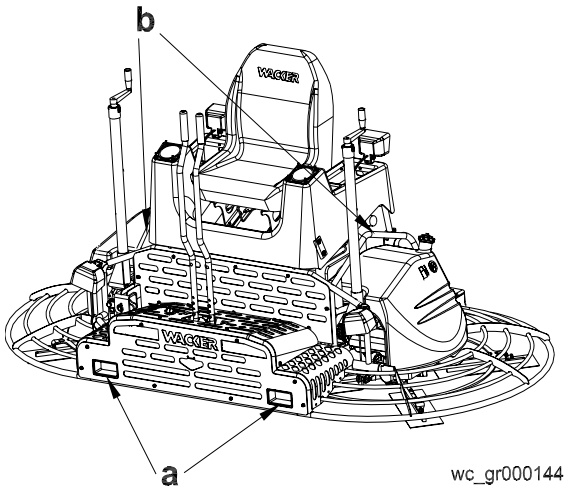
To hoist the trowel:

Attach a sling or chains through the lifting bars **(b)** on each side of the seat pedestal.

CAUTION: Make sure the lifting device has enough weight-bearing capacity to lift machine safely. Refer to Section *Technical Data.*

WARNING

DO NOT lift the trowel by the guard rings or any part of the trowel other than the lifting fixture, as the component may fail, causing the trowel to fall, possibly injuring bystanders.



4.5 Wheel Kit - 0150397

See Graphic: wc_gr002302

Assembling Wheel Kit Components:

4.5.1 Bolt the wheels **(b)** to the tube assemblies **(a)** using screws **(c)**, washers **(d)**, and nuts **(e)** provided. The rigid wheels should be attached perpendicular to the tube assemblies. The lock pin on the swivel casters should be perpendicular to the tube assemblies when attached.

4.5.2 Insert one handle **(g)** into the other handle **(g)**.

4.5.3 Align the holes.

4.5.4 Insert the screw **(h)** and tighten the nut **(j)**.

Raising the CRT:

4.5.5 Insert the wheel assemblies into the CRT fork lift pockets. Make sure the two swivel casters are toward the same end of the machine.

4.5.6 Insert the retaining pins **(f)** into the wheel assemblies.

CAUTION: Be sure the retaining pins **(f)** are in place before continuing.

4.5.7 Lock the swivel casters so that the wheels are in the same direction as the rigid casters.

4.5.8 Pivot each wheel bracket towards the closer end of the machine. If necessary, unlock the brackets by pulling on the spring pin and pivoting the wheel. The wheels should lock approximately parallel to the ground.

4.5.9 Insert the handle into the tube on one of the wheels.

4.5.10 Unlock the bracket by pulling on the spring pin and use the handle to pivot the bracket and raise the machine until the spring pin locks with the wheel in an upright position.

4.5.11 Repeat last two steps on the other three wheels. It is easiest to do both wheels on the same end of the machine first.

CAUTION: If there is weight on a wheel, it will pivot the wheel and handle, therefore firmly grip the handle.

4.5.12 Unlock the swivel casters.

4.5.13 Do not push on pitch posts during transport. Lift up on CRT to assist in turning.

Lowering the CRT:

4.5.14 Lock the swivel casters so that the wheels are in the same direction as the rigid casters.

4.5.15 Insert the handle into the tube on one of the wheel brackets.

4.5.16 Unlock the wheel by pulling on the spring pin and pivoting the wheel.

CAUTION: The weight of the trowel will pivot the wheel and handle, therefore firmly grip the handle.

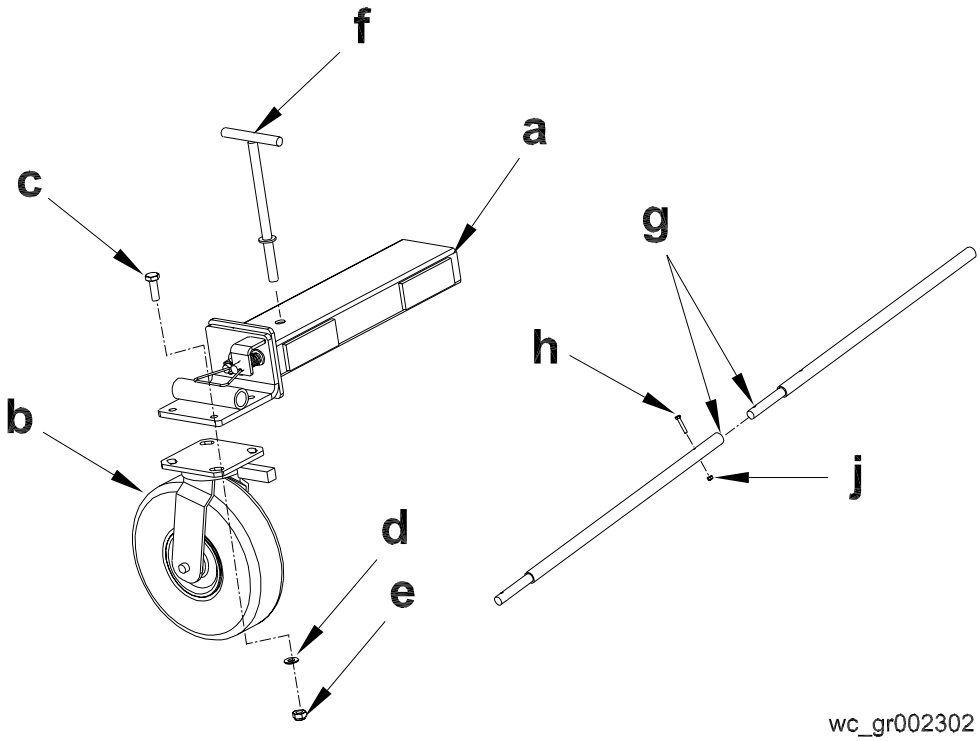
4.5.17 Pivot the wheel until it locks at 90 degrees.

4.5.18 Remove the handle.

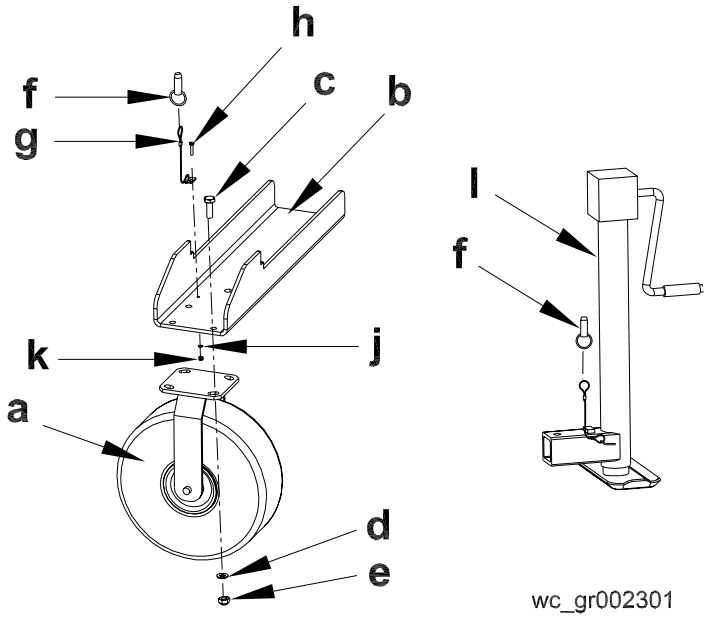
4.5.19 Repeat last four steps for the other wheels.

4.5.20 Remove the retaining pins from the wheel assemblies.

4.5.21 Remove the wheel assemblies from the machine.



wc_gr002302



wc_gr002301

4.6 Wheel Kit - 0154750

See Graphic: wc_gr002301

Assembling Wheel Kit Components:

4.6.1 Bolt the wheels **(a)** to the brackets **(b)** using screws **(c)**, washers **(d)**, and nuts **(e)** provided. The rigid wheels should be attached perpendicular to the brackets.

4.6.2 Attach pins **(f)** to lanyards **(g)** and jacks **(l)**.

4.6.3 Bolt lanyards to the brackets using screws **(h)**, washers **(j)**, and nuts **(k)** provided.

Raising the CRT:

4.6.4 Insert a screw jack into the square socket in the front of the CRT. Insert the pin into the bottom of the mount.

CAUTION: Be sure pin is in place before continuing.

4.6.5 Insert a jack into the square socket on the back of the CRT. Insert the pin into the top of the mount.

CAUTION: Be sure pin is in place before continuing.

4.6.6 Crank the jack handles to raise the CRT.

4.6.7 Insert the wheel assemblies into the front CRT fork pockets. Use one swivel and one rigid wheel. Insert the pins into the outer holes on the brackets.

CAUTION: Be sure pins are in place before continuing.

4.6.8 Insert the wheel assemblies into the rear CRT fork pockets. Place the swivel caster toward the same end of the machine as in the front. Insert the pins into the inner holes on the brackets.

CAUTION: Be sure pins are in place before continuing.

4.6.9 Lower the jacks so the weight rests on the wheels.

4.6.10 Unpin and remove the jacks.

Lowering the CRT:

4.6.11 Insert a screw jack into the square socket in the front of the CRT. Insert the pin into the bottom of the mount.

CAUTION: Be sure pin is in place before continuing.

4.6.12 Insert a jack into the square socket on the back of the CRT. Insert the pin into the top of the mount.

CAUTION: Be sure pin is in place before continuing.

4.6.13 Crank the jack handles to raise the CRT.

4.6.14 Unpin and remove the wheel assemblies from the CRT.

4.6.15 Lower the jacks so the weight rests on ground.

4.6.16 Unpin and remove the jacks.

CAUTION: Do not operate trowel with jacks installed.

4.7 Wheel Kit - 0160259

See Graphic: wc_gr002300

Assembling Wheel Kit Components:

4.7.1 Attach large wheels **(a)** to the axles **(b)** using washers **(c)**, and small cotter pins **(d)** provided. Store wheels on handle using large cotter pins **(h)**.

4.7.2 Attach small wheels **(e)** to handle using washers **(f)**, and small cotter pins **(g)** provided.

Raising the CRT:

4.7.3 Remove safety snap pin **(j)** and lengthen handle. Insert safety snap pin **(j)**.

4.7.4 Remove large wheels from handle.

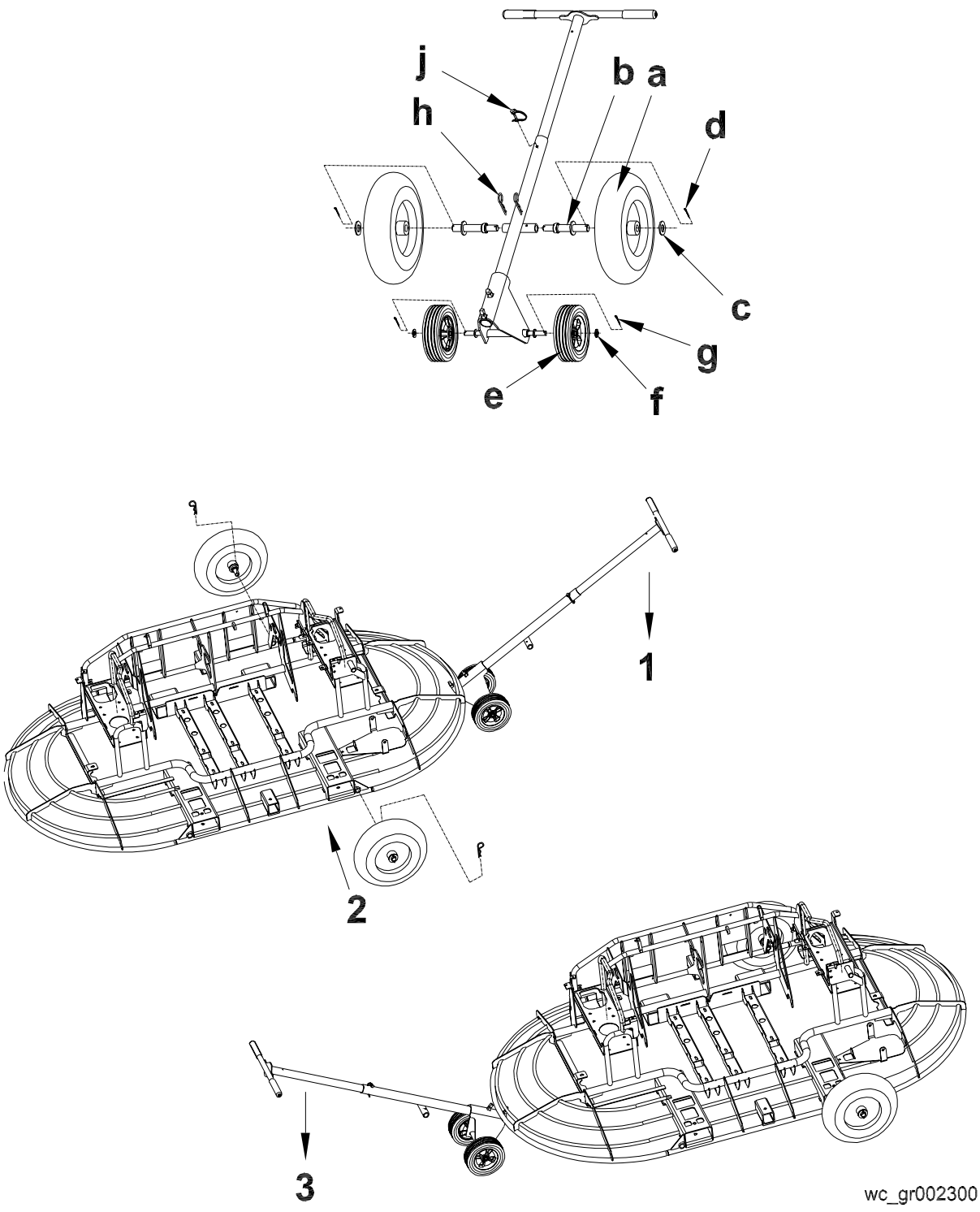
4.7.5 Using the handle, lift one end of the trowel **(1)** and insert the large wheels **(2)** as shown.

4.7.6 Move handle to other end of trowel **(3)**, lift and transport.

Lowering the CRT:

4.7.7 Lift the end of the trowel with wheels.

4.7.8 Remove wheels and lower trowel. Store wheels on handle using large cotter pins **(h)**.


j
h
b a
d
c
g
e
f
1
2
3
wc_gr002300

5. Drive Line

5.1 Belt Replacement

See Graphic: wc_gr 000152

To replace the drive belt:

5.1.1 Place the trowel on a flat, level surface with the blades pitched flat.

5.1.2 Disconnect battery.

5.1.3 Remove the beltguard.

Honda / Kohler:

Remove bolts holding guard in place.

Vanguard:

Remove two bolts holding base of air cleaner to beltguard. Remove two bolts holding beltguard to engine.

5.1.4 Remove 2 bolts **(d)**, washers **(e)** and nuts **(f)** from each bearing flange.

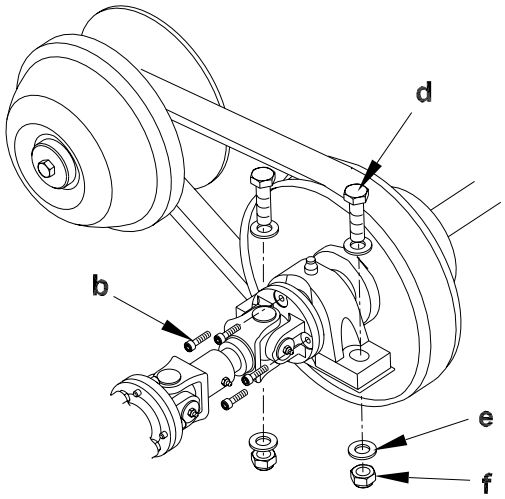
5.1.5 Remove the 4 bolts **(b)** holding each inside universal joint to the shaft fitting. Remove universal joints and shims (if included) from ends of drive shaft.

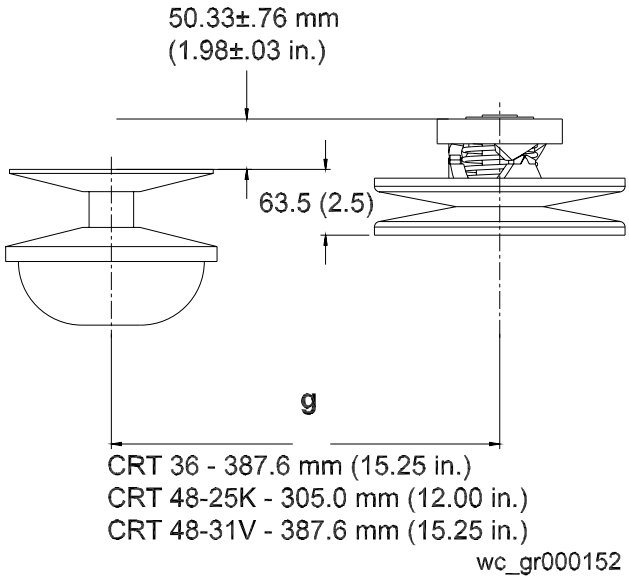
5.1.6 Lift the drive pulley up far enough to slide belt past.

5.1.7 Remove the old belt and install a new one.

5.1.8 Reverse the procedure for assembly. Align the bearings and shaft as straight as possible. Adjust pulley offset and center distance to values as shown.

5.1.9 Torque the bearing bolts **(d)** to 99±10 ft.lbs. Torque the universal joint bolts **(b)** to 10±1 ft.lbs.





5.2 Belt Adjustment

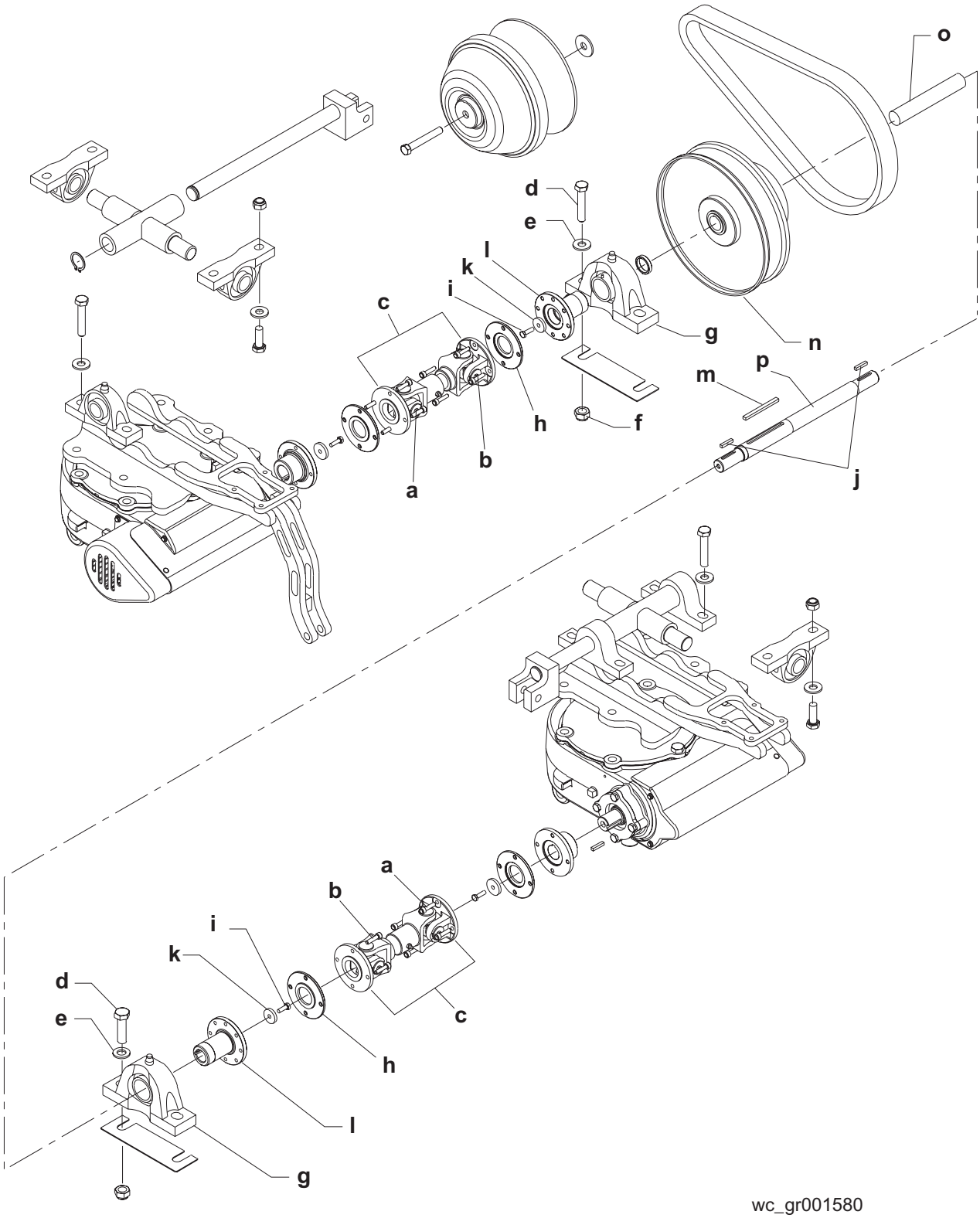
5.2.1 Remove beltguard.

5.2.2 To adjust the tension, loosen the 4 mounting bolts and slide engine forward to loosen; back to tighten.

5.2.3 Maximum belt play should be from 32 mm to 38 mm (1 1/4" to 1 1/2") at the center of the span.

Note: *Tension on new belts should be checked after the first 10-12 hours of operation.*

5.3 Drive Line Exploded View



5.4 Drive Line Teardown and Rebuild

See Graphic: wc_gr001580

Teardown:

5.4.1 Remove drive belt. See Section *Belt Replacement.*

5.4.2 Remove 4 screws **(a)** from outside end of each universal joint **(c)**.

5.4.3 Remove 2 bolts **(d)**, washers **(e)** and nuts **(f)** from each bearing flange **(g)**.

5.4.4 Remove the drive shaft and clutch as an assembly.

5.4.5 Remove 4 screws **(b)** from inside end of each universal joint **(c)**. Remove universal joints and shims **(h)** (if included) from ends of drive shaft.

5.4.6 Remove center bolt **(i)** and washer **(k)** from outer joint fitting **(l)**. Remove bearing flange **(g)** with a puller. Remove key **(j)**. Repeat for other side.

5.4.7 Slide clutch **(n)** and spacer **(o)** off. Remove key **(m)**.

Rebuild:

5.4.8 Apply anti-seize compound to mounting areas of shaft **(p)**.

5.4.9 Replace key **(m)**. Slide clutch **(n)** and spacer **(o)** onto shaft.

5.4.10 Replace keys **(j)**. Replace bearing flange **(g)** and fitting **(l)**. Apply Loctite 243 to center bolt **(i)** and reinstall with washer **(k)**. Torque to 10 Nm (7 ft.lbs.).

5.4.11 Attach inside end of each universal joint and shims with 4 screws **(b)**. Torque to 10 Nm (7 ft.lbs.).

5.4.12 Repeat last 2 steps to assemble other side.

5.4.13 Replace assembled drive shaft and clutch into machine.

5.4.14 Apply Loctite 243 to the 2 bolts **(d)** and reinstall each bearing flange **(g)** with washers **(e)** and nuts **(f)**. Torque to 135 Nm (99 ft.lbs.).

5.4.15 Apply Loctite 243 to the 4 screws **(a)** and attach outside end of each universal joint **(c)**. Torque to 10 Nm (7 ft.lbs.).

5.4.16 Replace drive belt. See Section *Belt Replacement.*

6. Gearbox and Spider

6.1 Gearbox Basics

See Graphic: wc_gr001579

Rotation of the gearboxes will differ depending on which side of the trowel the gearbox is located. Gearboxes located on the Right-hand side of the trowel rotate counterclockwise or left-hand rotation when viewed from the top. Gearboxes on the Left-hand side of the trowel rotate clockwise or right-hand rotation. The blade rotors rotate IN under the operator.

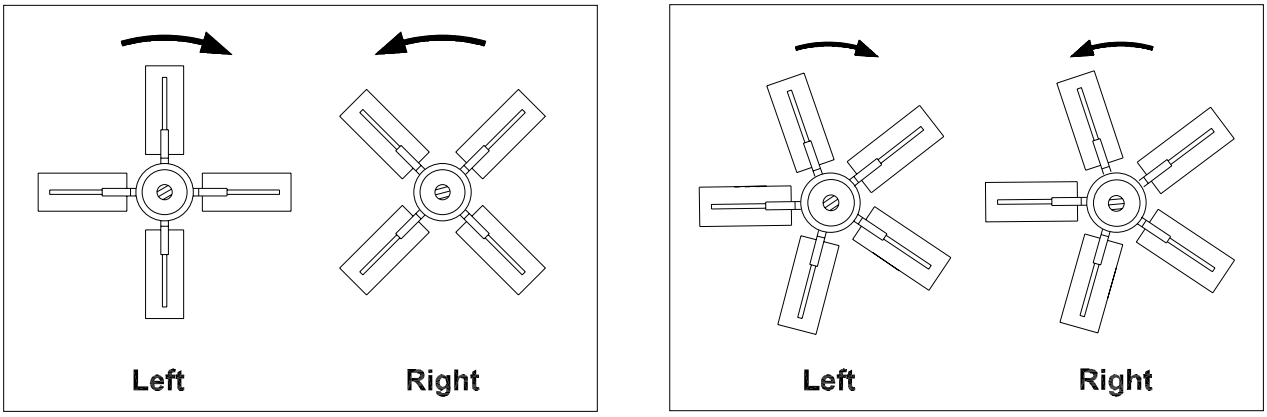
Blade rotors require timing so they will not interfere with each other during operation.

Anytime the drive line or gearboxes are removed, timing may be required. When properly timed, the blades should be positioned 45 degrees off of each other.

To time the rotors:

6.1.1 Elevate the trowel off the ground. Use either the dolly jack wheels or place the trowel on blocks.

6.1.2 Rotate the input shaft of the uncoupled gearbox until the blades align as shown.



wc_gr001579

6.2 Gearbox Removal and Installation

See Graphic: wc_gr001582

6.2.1 Place trowel on a flat, level surface large enough for the trowel and capable of supporting the weight of the trowel.

To remove right side gearbox:

6.2.2 Drain water tank. Remove 2 bolts located under tank.

6.2.3 Remove water line from tank by loosening clamp and pulling off tube. Remove tank.

To remove left side gearbox:

6.2.4 Close fuel valve. Remove bolts located under tank.

6.2.5 Loosen clamp and slide hose from fitting.

Removal:

6.2.6 Remove nut **(q)** from each pitch cable and pull cable out of pitch yoke.

6.2.7 Remove 4 screws **(a)** from outside end of each universal joint **(c)**.

6.2.8 Remove 2 bolts **(r)** and washers **(s)** holding each gearbox mount bearing flange **(t)** on each gearbox.

6.2.9 Using an appropriate lifting device, carefully and slowly lift the trowel off the gearbox.

WARNING

Trowel will be unbalanced and could swing. Be sure to have an additional person to guide the trowel.

6.2.10 Proceed to Section *Spider Removal and Installation* for spider removal.

Installation:

6.2.11 Proceed to Section *Spider Removal and Installation* for spider installation.

6.2.12 To reinstall the gearboxes, place the gearbox under the trowel.

6.2.13 Align the bolt holes and apply Loctite 243 or equivalent to the bolts **(r)** and reinstall along with washers **(s)**. Torque bolts to 86 Nm (60 ft.lbs.).

6.2.14 Replace 4 screws **(a)** from outside end of each universal joint **(c)**.

6.2.15 Pull each cable down to the pitch yoke and thread it through the hole of the pitch cable mount **(u)**. Attach nut **(q)**.

To install right side gearbox:

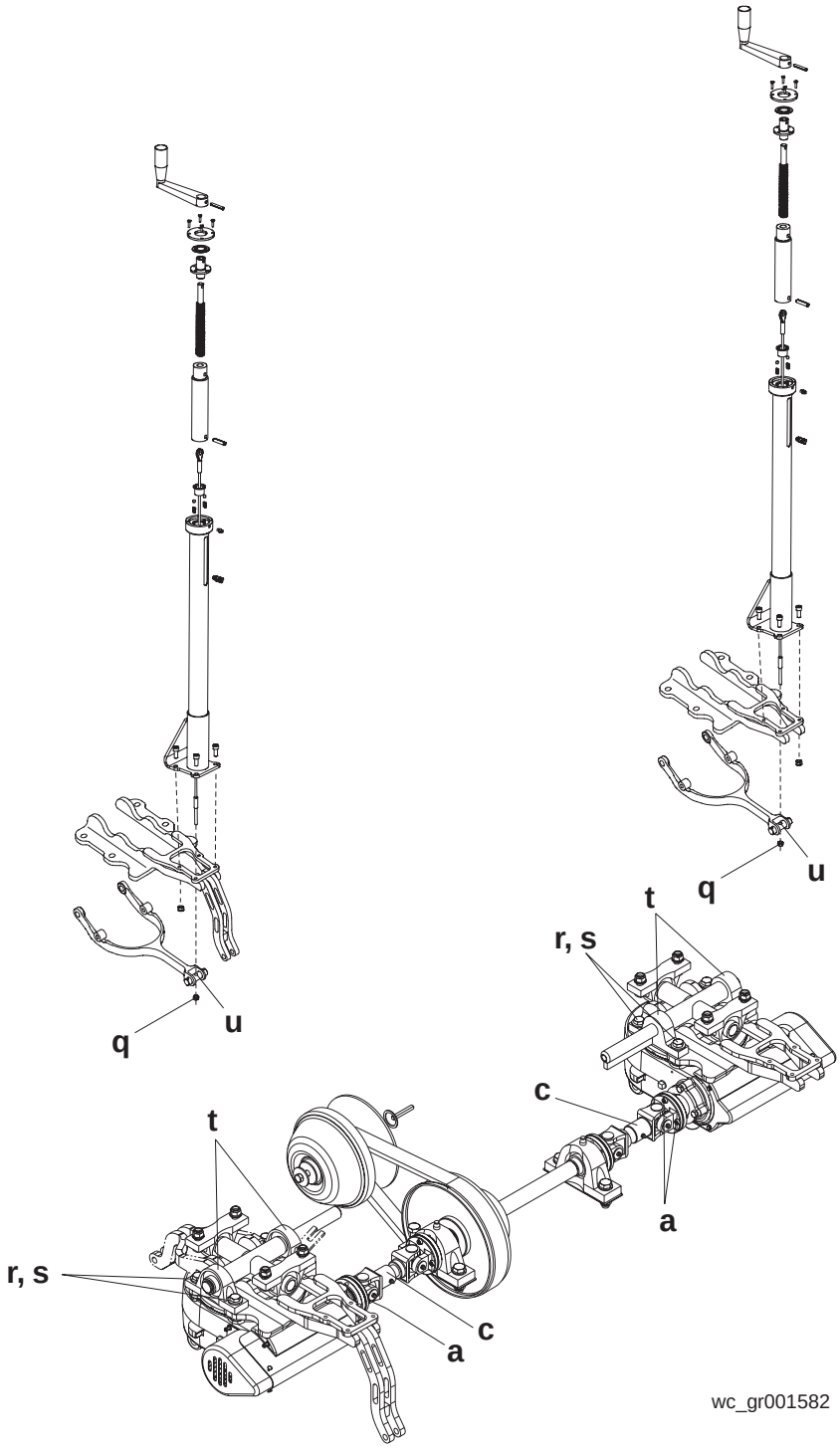
6.2.16 Replace water tank. Attach tube and tighten clamp.

6.2.17 Install 2 bolts located under tank. Fill water tank.

To install left side gearbox:

6.2.18 Slide hose into fitting and tighten clamp.

6.2.19 Install bolts located under tank. Open fuel valve.



6.3 Spider Removal and Installation

See Graphic: wc_gr001583, wc_gr001580

Removal:

6.3.1 Remove gearbox. See Section *Gearbox Removal and Installation.*

6.3.2 Loosen blade arms.

For 36" models:

- Remove grease fittings **(aa)** from spider.

For 48" models:

- Remove stabilizer ring shoulder bolts **(v)** from arm ends and lift ring **(y)** off.

6.3.3 Remove blades by removing mounting bolts **(x)** from arms.

CAUTION: Blades may have sharp edges.

6.3.4 Remove shoulder bolts **(w)** from lift ring assembly. Take care not to move lifting links **(qq)** unless readjustment is being done.

6.3.5 Remove cotter pin **(ff)** and pivot pin **(gg)** from blade yoke **(hh),** and remove blade yoke.

6.3.6 Remove plug **(dd)** from spider. Using a 17mm socket, remove bolt **(bb)** and washer **(cc)**. Remove spider from shaft.

6.3.7 Remove key **(m)** and spacer **(o)** from gearbox output shaft.

6.3.8 Remove lift ring assembly **(ii)** from spider **(ee)**.

6.3.9 Repeat for opposite gearbox.

Installation:

6.3.10 Install lift ring assembly **(ii)** onto spider **(ee)**.

6.3.11 Install spacer **(o)** and key **(m)** to output shaft. Apply anti-seize compound to gearbox output shaft.

6.3.12 Place spider onto output shaft. Take care to align the keyways. Replace washer **(cc)** and apply Loctite 243 or equivalent to bolt **(bb)**, and torque to 102 Nm (75 ft.lbs.). Install plug **(dd)**.

6.3.13 Place blade yoke **(hh)** under tubes **(ll)** on lift ring assembly. Install pivot pin **(gg)** and install cotter pins **(ff)**.

6.3.14 Replace blade arms.

For 36" models:

- Place arms into spider and install grease fittings **(aa)**.

For 48" models:

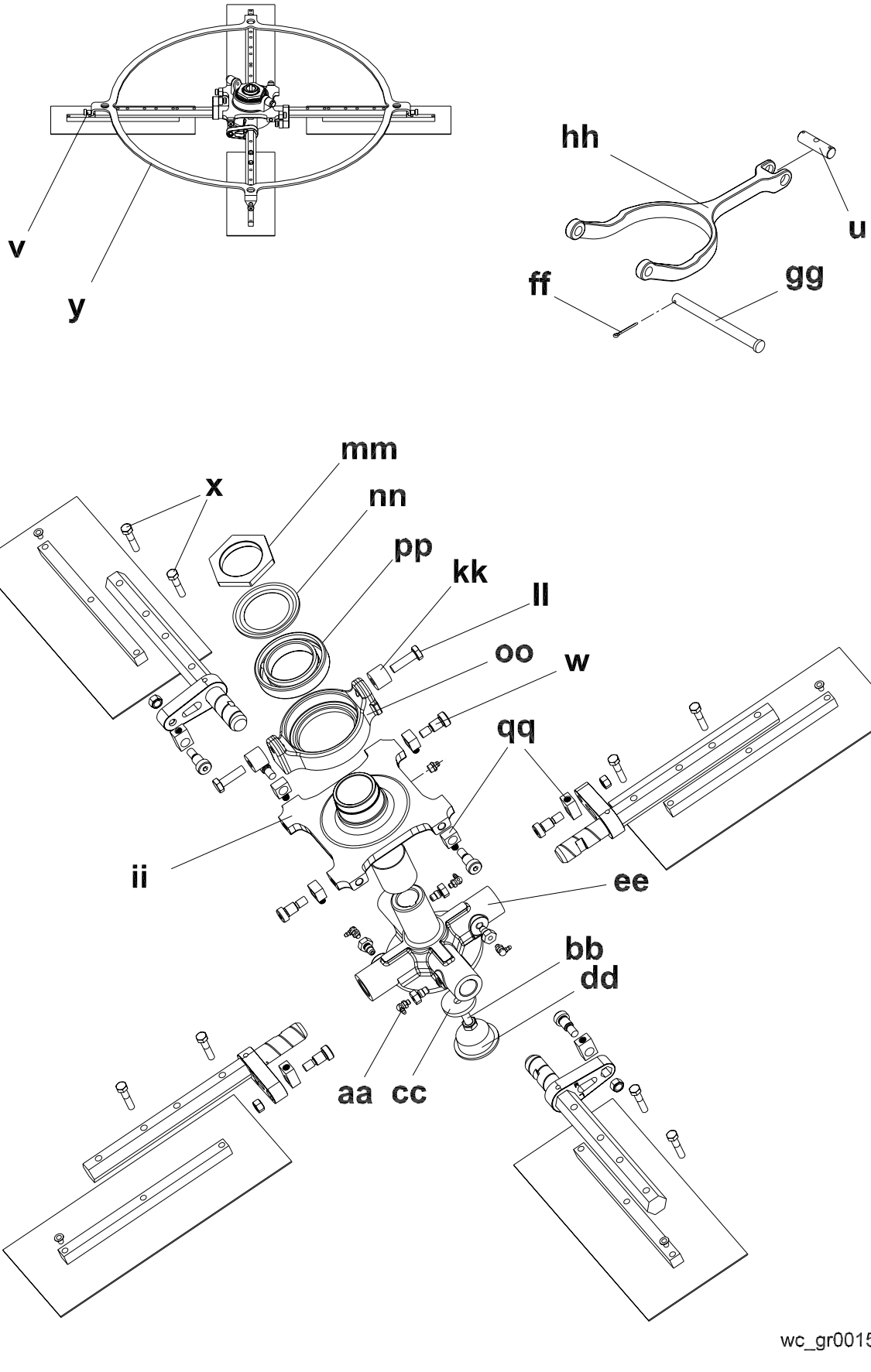
- Place stabilizer ring **(y)** on spider before installing blade arms. Replace arms into spider. Apply Loctite 243 or equivalent to shoulder bolt **(v)** and install into arm. Tighten bolts only enough to remove play in ring.

6.3.15 Replace shoulder bolts **(w)** into lifting ring. Do not tighten if links are in need of adjustment. See Section *Lift Ring Disassembly and Assembly*.

6.3.16 Install blades using bolts **(x)** through arms.

6.3.17 Install spider onto gearbox.

6.3.18 Attach gearbox. See Section *Gearbox Removal and Installation*.


v
y
hh
u
ff
gg
mm
x
nn
pp
kk
ll
oo
w
qq
ii
ee
bb
dd
aa
cc
wc_gr001583

6.4 Lift Ring Disassembly and Assembly

See Graphic: wc_gr001583, wc_gr002447

Disassembly:

6.4.1 Remove gearbox. See Section *Gearbox Removal and Installation*.

6.4.2 Remove spider. See Section *Spider Removal and Installation*.

6.4.3 Lift ring assembly **(ii)** from spider.

6.4.4 Clamp assembly securely in vise and remove the lift cap **(mm)** by unthreading.

6.4.5 Remove seal ring **(nn)** and bearing holder **(oo)**. Press bearing **(pp)** from bearing holder.

Assembly:

6.4.6 Press bearing **(pp)** into bearing holder **(oo)**.

6.4.7 Apply anti-seize to threads and bearing area of lift ring **(ii)**.

6.4.8 Slide bearing holder and bearing onto lift ring.

6.4.9 Thread lift cap **(mm)** onto ring **(ii)** and tighten.

6.4.10 Slide tubes **(kk)** onto bolts **(ll)**. Apply Loctite 243 or equivalent to threads and thread into bearing holder **(oo)**. Do not overtighten as tubes should rotate freely.

6.4.11 Install lift assembly onto spider.

6.4.12 Replace spider. See Section *Spider Removal and Installation*.

6.4.13 Replace gearbox. See Section *Gearbox Removal and Installation*.

Lift Link Adjustment (blade arm):

6.4.14 Set trowel on a flat surface. Install new blades for adjustment.

6.4.15 Turn blade pitch controls until blades are one-half pitch.

6.4.16 Wacker recommends using an angle gauge to check and adjust blade angle **(1)**.

6.4.17 Check the angle of each blade by placing the gauge along the front edge of the blade.

6.4.18 If adjustment is needed, remove shoulder bolt **(w)** and turn link **(qq)** in to increase or out to decrease blade angle.

Note: *All blades must be set at the same angle for correct operation.*

6.4.19 Once all blade angles have been set, apply Loctite 243 or equivalent to shoulder bolt threads and tighten bolts.

Alternate Lift Link Adjustment method:

6.4.20 Set trowel on a flat surface. Install new blades for adjustment.

6.4.21 Turn blade pitch controls until blades are at one-half pitch.

6.4.22 Using a combination square, place the end of the blade on the flat surface **(2)**.

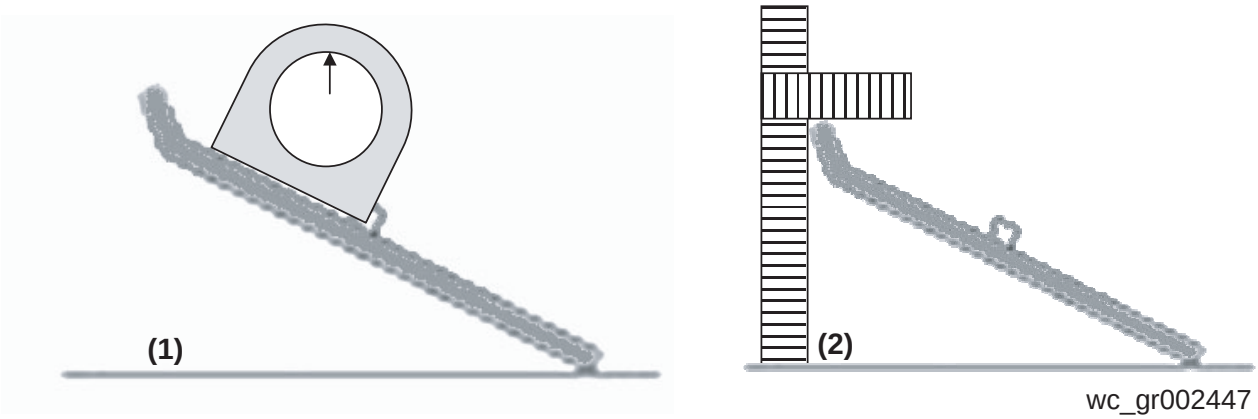
6.4.23 With the combination square's blade against the front (raised) edge of the trowel blade, move the sliding portion down to the top of the trowel blade and lock it in place.

6.4.24 Check each blade against this measurement.

6.4.25 If adjustment is needed, remove shoulder bolt **(w)** and turn link **(qq)** in to increase or out to decrease blade angle.

Note: *All blades must be set at the same angle for correct operation.*

6.4.26 Once all blade angles have been set, apply Loctite 243 or equivalent to shoulder bolt threads and tighten bolts.



wc_gr002447

6.5 Gearbox Disassembly

See Graphic: wc_gr001584

6.5.1 Remove gearbox. See Section *Gearbox Removal and Installation.*

6.5.2 Remove spider assembly. See Section *Spider Removal and Installation.*

6.5.3 Remove the drain plug **(a)** and allow the oil to drain out. It may be necessary to remove the oil fill plug **(cc)** to facilitate draining. Open or remove pressure relief valve **(b)** if needed.

Note: *In the interests of environmental protection, place a plastic sheet and a container under the machine to collect any liquid which drains off. Dispose of this liquid in accordance with environmental protection legislation.*

6.5.4 For 48" models:

- Remove protective guard **(c)** by removing 2 screws **(d),** washers **(e)**, and 2 studs **(f)** from gearbox.
- Remove center screw **(g)** and washer **(h)** from fan **(i)**. Remove fan.

6.5.5 Remove 4 screws **(j)** from each seal cover **(k)**. Remove covers, shim(s) **(l)**, and o-rings **(m)**.

6.5.6 Remove 2 bolts **(n)** from top cover **(o)**. Remove top cover, shim(s) **(p)**, and o-rings **(q)**.

6.5.7 Using rubber hammer, tap input shaft **(r)** towards opposite end. Remove output shaft **(s)** with output gear **(t)**. Remove shaft.

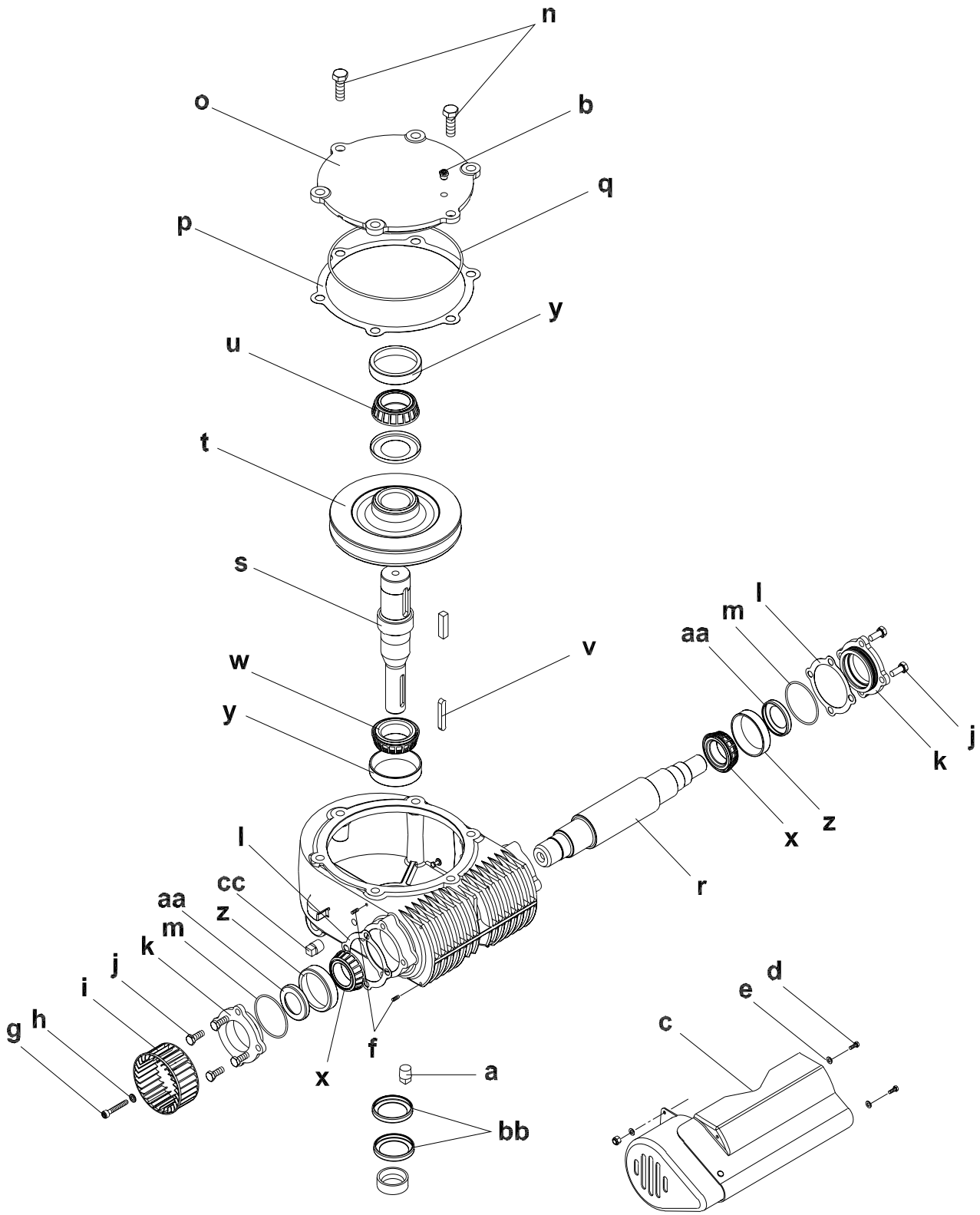
6.5.8 Support the output gear **(t)** in a press. Press the output shaft out through the gear and upper bearing **(u)**.

6.5.9 Remove the key **(v)** from the output shaft and press off lower bearing **(w)**.

Note: *If there is difficulty removing roller cup bearings from shafts, heat housing until cup removes easily.*

6.5.10 Press bearings **(u, w, x)** off each shaft **(r, s)**. Remove bearing cups **(y, z)** and seals **(aa, bb)**.

6.5.11 Clean parts with appropriate cleaning solvent.


n
o
b
q
p
y
u
t
s
v
w
y
l
m
aa
j
k
z
x
r
l
cc
aa
z
m
k
j
i
g
h
f
x
a
bb
d
e
c
wc_gr001584

6.6 Gearbox Assembly

See Graphic: wc_gr001584

6.6.1 Pack area between the 2 seals **(bb)** with grease and press into bottom of gearbox, lip side facing inward.

6.6.2 Reassemble the input and output shafts.

6.6.3 Oil input shaft bearings **(x)** and loosely insert input shaft **(r)** into gearbox housing.

6.6.4 Pack upper bearing **(u)** with grease on output shaft **(s)** and lightly oil lower bearing **(w)**. Carefully install output shaft into housing.

6.6.5 Install input bearing cup **(z)** so it is flush with housing. Tap in with rubber mallet.

6.6.6 Starting with the input shaft coupling side, replace cover **(k)**, shim(s) **(l)**, and o-ring **(m)**.

6.6.7 Replace other seal **(k)** and check for input shaft end play. Shaft should have up to 0.05 mm (0.002") play. Add or remove shims under input endcap to achieve proper end-play. Apply Loctite 243 or equivalent to screws **(j)** and torque to 25 Nm (18 ft.lbs.).

6.6.8 Replace top cover **(o)**. Replace pressure relief valve **(b)** if removed.

6.6.9 Tap the end of the output shaft with a deadblow hammer to seat bearings. Check the output shaft side-play. Side-play should be 0.00 to 0.05 mm (0.00" to 0.002"). Add or remove shims as needed.

6.6.10 Apply Loctite 243 or equivalent to cover screws **(n)** and torque to 86 Nm (60 ft.lbs.).

6.6.11 Apply Loctite 545 or equivalent to the oil drain plug **(a)** and replace.

6.6.12 With the gearbox level, fill with approximately 1.83 l (62 oz.) Mobil SHC634 synthetic gear oil through the oil fill plug **(cc)** located on the side of the gearbox. Oil level should be even with the bottom of the opening. DO NOT overfill. Wipe the threads dry on both the gearbox and the oil fill plug, apply Loctite 545 or equivalent to the oil fill plug threads, replace the oil fill plug and torque to 16-20 Nm (12-15 ft.lbs.).

6.6.13 For 48" models:

- Replace fan **(i)**. Apply Loctite 243 or equivalent to center screw **(g)** and install with washer **(h).** Torque to 10 Nm (7 ft.lbs.).
- Replace protective guard **(c)**. Apply Loctite 243 or equivalent to 2 screws **(d)** and install with washers **(e)**. Apply Loctite 243 or equivalent to 2 studs **(f)** and install. Torque to screws and studs to 3.4 Nm (2.5 ft.lbs.). DO NOT overtighten screws or cover could be damaged.

7. Steering and Pitch Control

7.1 Removal and Installation of Manual Steering Yokes

See Graphic: wc_gr001581, wc_gr001653

Removal:

7.1.1 Unplug wiring harness **(a)**. Remove 4 bolts **(b)** holding steering levers **(d)** on the handle mounts **(c)**.

7.1.2 Remove 4 screws from front grill panel. Unplug water pump and remove panel.

7.1.3 Remove bolts **(d, e)** and spacers **(f)** from bottom of each steering lever.

7.1.4 Remove bolt **(g)** and nut **(h)** from each pivot bracket **(i)**.

7.1.5 Remove screws **(j)** and nuts **(k)** from outside bearings **(l)**.

7.1.6 Remove directional control shaft.

7.1.7 Remove screws **(m)** and nuts **(n)** from center bearings **(o)**.

Installation:

7.1.8 Grease center bearings **(o)** and attach with screws **(m)** and nuts **(n)**. Torque screws to 24 Nm (18 ft.lbs.).

7.1.9 Install directional control shaft.

7.1.10 Attach outside bearings **(l)** with screw **(j)** and nuts **(k)**. Torque screws to 24 Nm (18 ft.lbs.).

7.1.11 Attach each pivot bracket **(i)** with bolt **(g)** and nut **(h)**.

7.1.12 Attach each steering lever with bolts **(d, e)** and spacers **(f)**.

7.1.13 Adjust the steering handle pitch by loosening the nuts on the left/right pivot links **(q)** and turning the adjustable links to increase or decrease the handle pitch. The optimum pitch has been determined to be 5° forward for most operators. A rafter angle gauge works well for determining pitch. After setting desired pitch, torque nuts to 75 Nm (55 ft.lbs.).

7.1.14 Adjust the steering handle force and travel. Locate the forward/reverse steering pivots **(r)** and the left/right pivot links **(q)**. The attaching bolts **(s)** and nuts **(t)** for these links can be moved to the front or rear mounting holes. The hole towards the front of the machine will give the operator a lighter steering handle feel but does require a bit more handle travel for steering responsiveness. Placing the link in the rear hole will increase the steering response somewhat but also increases the amount of effort needed to move the steering handles. The links also need to be moved in the upper pivot bracket **(i)** so the adjustable link remains in a vertical position. Torque the nuts **(t)** to 75 Nm (55 ft.lbs.).

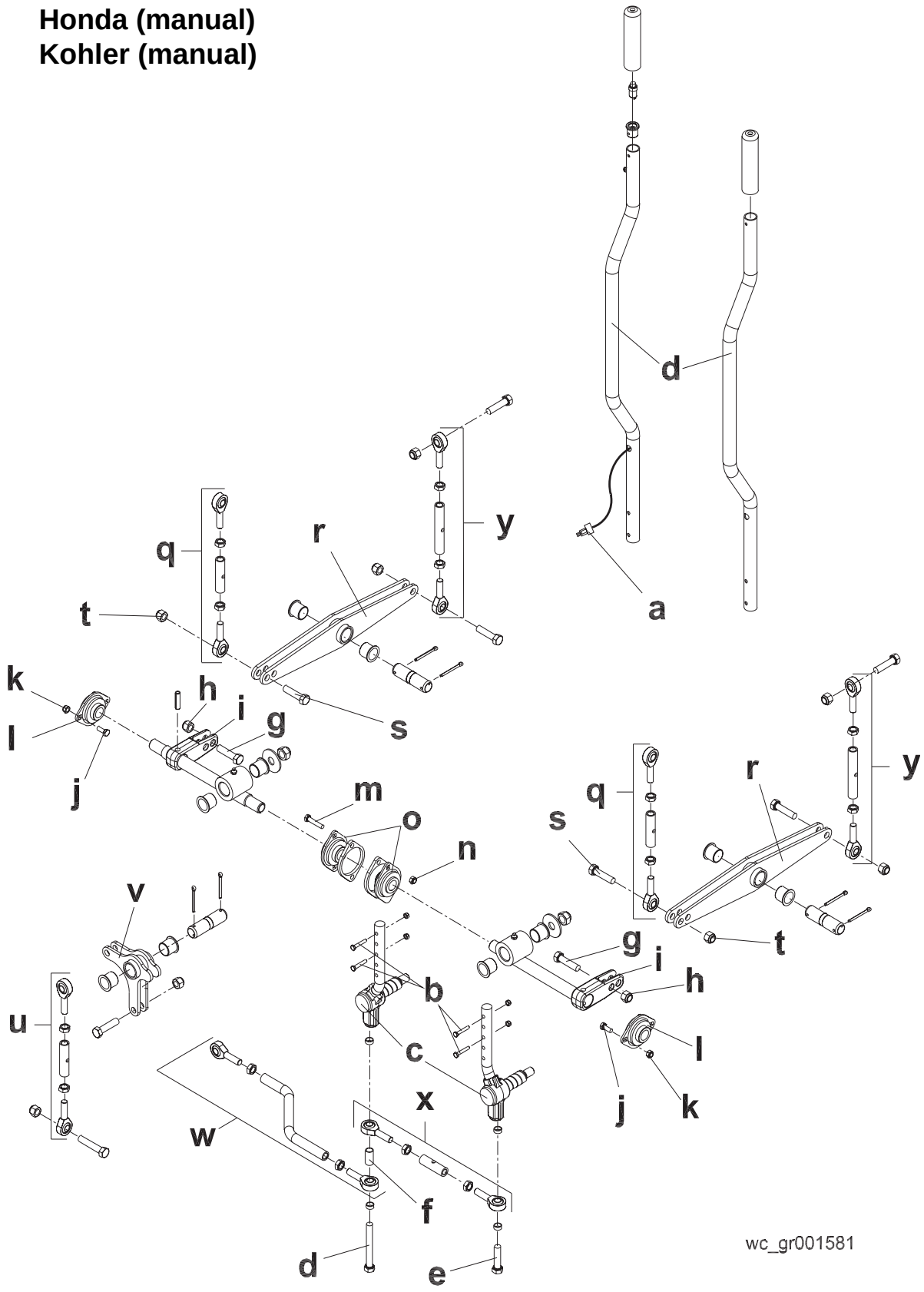
7.1.15 Center the steering handles. The left pivot bracket **(v)** must be in a horizontal position when the machine is at rest. This link attaches to the gearbox pivot and the left pivot bracket **(v)**. To adjust, loosen the jam nuts on the left/right pivot link **(u)** and turn until the left pivot bracket **(v)** is horizontal. Torque the nuts to 75 Nm (55 ft.lbs.). If steering handles are not centered, loosen the nuts on the offset pivot link **(w)** and remove the bolt **(d)** from the bottom of the steering handle. Turn the handle mounts **(c)** until the steering handles are centered. Reinstall the bolt **(d)** into the bottom of the steering handle. Torque the jam nuts on the offset pivot link **(w)** to 75 Nm (55 ft.lbs.).

7.1.16 Adjust steering handle spacing. Loosen the jam nuts on the handle pivot link **(x)**. Loosen the bolts **(d, e)** from the bottom of the steering handles. Turn the handles in or out to increase or decrease to the width preferred by the operator. Torque the jam nuts and bolts to 75 Nm (55 ft.lbs.).

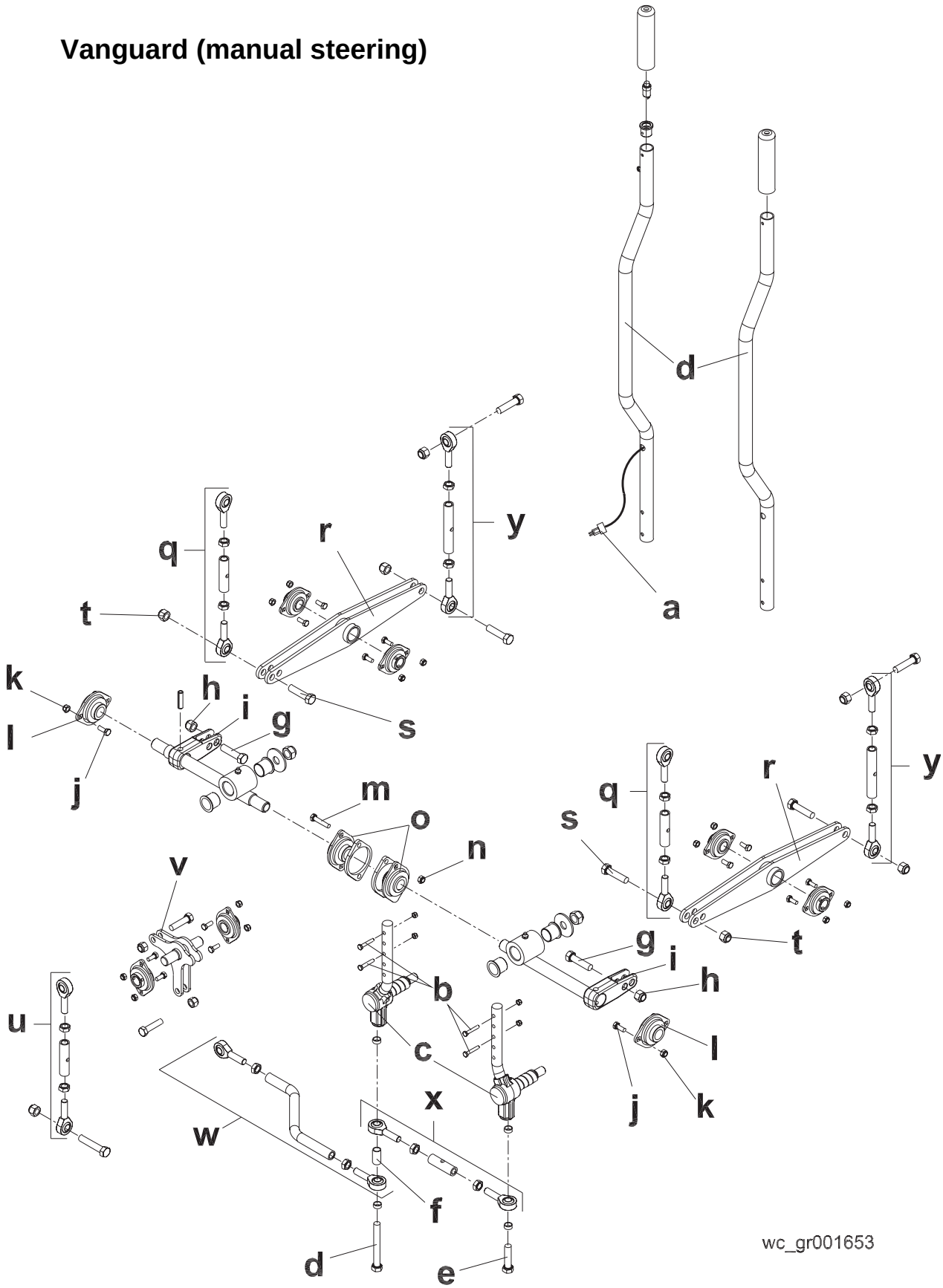
7.1.17 Adjust forward and reverse movement. The forward/reverse steering pivots **(r)** must be in a horizontal position when the machine is at rest. Loosen the jam nuts on the pivot links **(q and y)**. Turn the links in or out to level the steering pivots. Torque the jam nuts to 77 Nm (57 ft.lbs.).

7.1.18 Attach front grill panel with 4 screws and plug in water pump.

Honda (manual)
Kohler (manual)



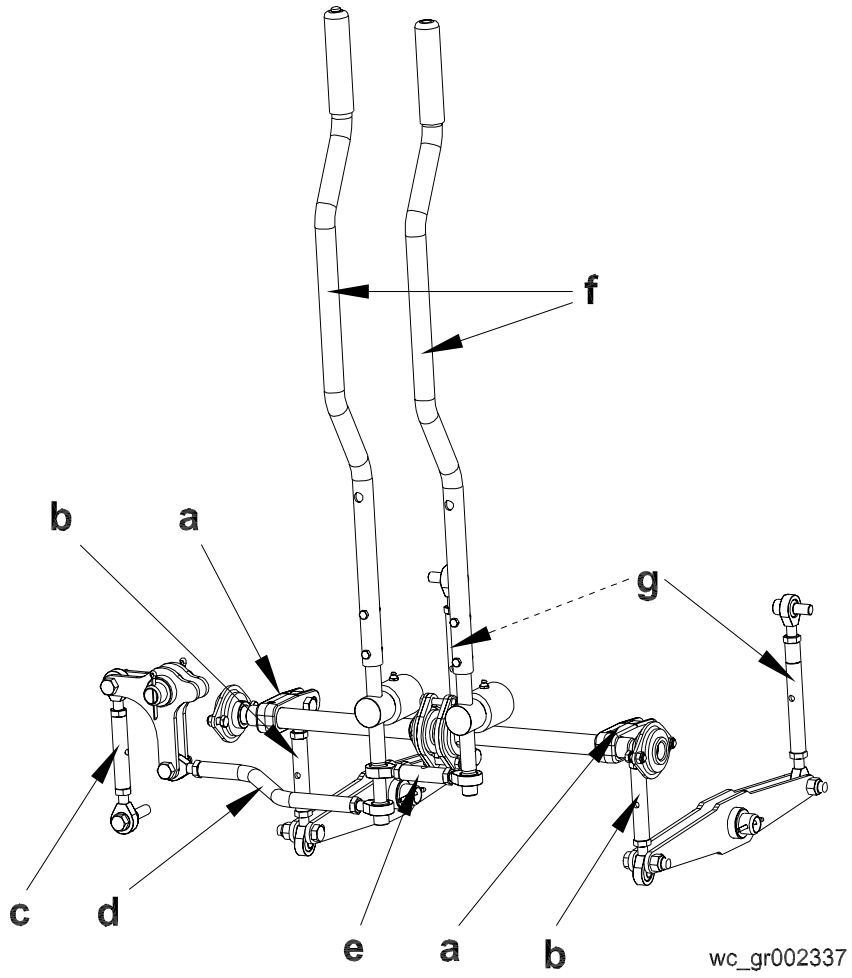
Vanguard (manual steering)



7.2 Adjustment of Manual Steering

See Graphic: wc_gr002337

Ref.	Description	Ref.	Description
a	Tilts down 5° when steering handles are tilted towards seat	e	CRT 48: 13.97 cm (5 1/2") CRT 36: 12.70 cm (5") between center lines of tie-rods
b	16.83 cm (6 5/8") between center lines of tie-rods	f	Tilt steering handles towards seat: 5° Spread steering handles towards rotors: CRT 48: 2°–3° CRT 36: 4°–5°
c	15.88 cm (6 1/4") between center lines of tie-rods	g	19.37 cm (7 5/8") between center lines of tie-rods
d	CRT 48: 48.26 cm (19") CRT 36: 35.88 cm (14 1/8") between center lines of tie-rods		



7.3 Pitch Control Removal and Installation

See Graphic: wc_gr001585

Removal:

7.3.1 Remove water or fuel tank if necessary. See Section *Gearbox Removal and Installation* (steps 2-4).

7.3.2 Turn handle down **(r)** to remove tension on pitch cable **(g)**.

7.3.3 Disconnect pitch cable **(g)** by removing locknut **(t)** located under the lift yoke **(m)**.

7.3.4 Remove four screws **(a)** and nuts **(b)** from bottom of pitch control. Lift from machine.

7.3.5 Remove four screws **(n)** and carefully turn handle **(r)** up to remove handle assembly.

7.3.6 Remove two spring-loaded balls and springs **(c)** from housing.

7.3.7 If replacing cable, remove the index bolt **(h)** from the long nut **(f)** and slide out of tube.

7.3.8 Press pin **(k)** out enough to slide cable out of holder.

Installation:

7.3.9 If pitch cable **(g)** was removed, insert cable into long nut **(f)** and press pin **(k)** through end of cable to secure.

7.3.10 Install long nut **(f)** into bottom of tube **(j)**. Apply Loctite 243 or equivalent to threads of index bolt **(h)** and install into nut.

7.3.11 Lightly grease spring-loaded balls and springs **(c)** and install.

7.3.12 Lightly grease threaded shaft **(e)** and screw into tube **(l)**.

7.3.13 Gently seat crank handle assembly onto spring-loaded balls **(c)**. Apply Loctite 243 or equivalent to screws **(n)** and tighten. Torque to 2.94 Nm (26 in.lbs.).

7.3.14 Install pitch post labeled “L” on the left gearbox pivot and pitch post labeled “R” on the right gearbox pivot.

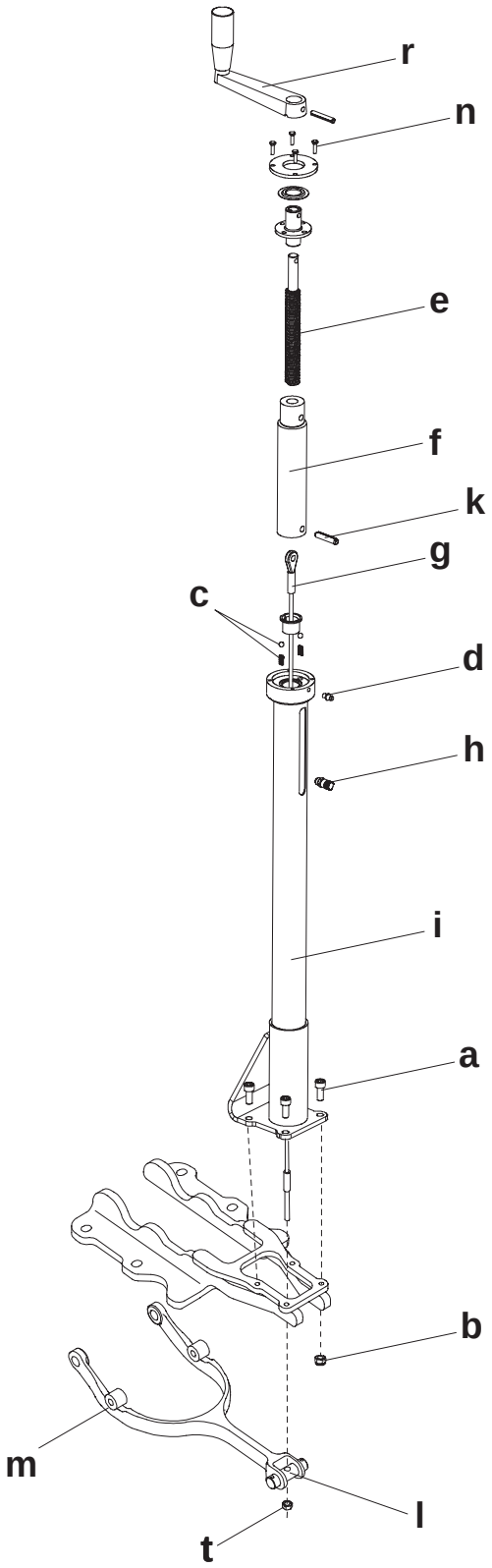
Note: *Left and Right are defined from operator’s position.*

7.3.15 Apply Loctite 243 or equivalent to screws **(a)**. Install screws and torque to 25 Nm (18 ft.lbs.).

7.3.16 Insert threaded end of pitch cable into the pitch cable mount **(l)**. With the handle cranked to the lowest position and the blades flat (0° pitch), lift the yoke **(m)** until it contacts the rollers. Thread on locknut **(t)** until it contacts the mount **(l)**.

7.3.17 Be sure that blades are flat and all slack is removed from the cable.

7.3.18 Replace water tank or fuel tank if removed.



wc_gr001585

7.4 Removal and Installation of Electric Steering Load Pins

See Graphic: wc_gr002280

Removal:

7.4.1 Turn ignition switch to the OFF position.

7.4.2 Trowel should be on a flat surface with the blades pitched flat.

7.4.3 Flip seat assembly forward. Make sure seat lock engages.

7.4.4 For the rear actuator (left/right steering), remove the protective cover **(a)**.

7.4.5 Disconnect the load pin wiring connector **(b)**.

7.4.6 Using snap ring pliers, remove the load pin retaining snap ring **(c)** from the shaft.

7.4.7 Support the actuator motor and carefully remove the load pin **(d)**. Secure the actuator motor to prevent damage.

Installation:

7.4.8 Align actuator motor mounting hole and carefully insert the load pin **(d)**.

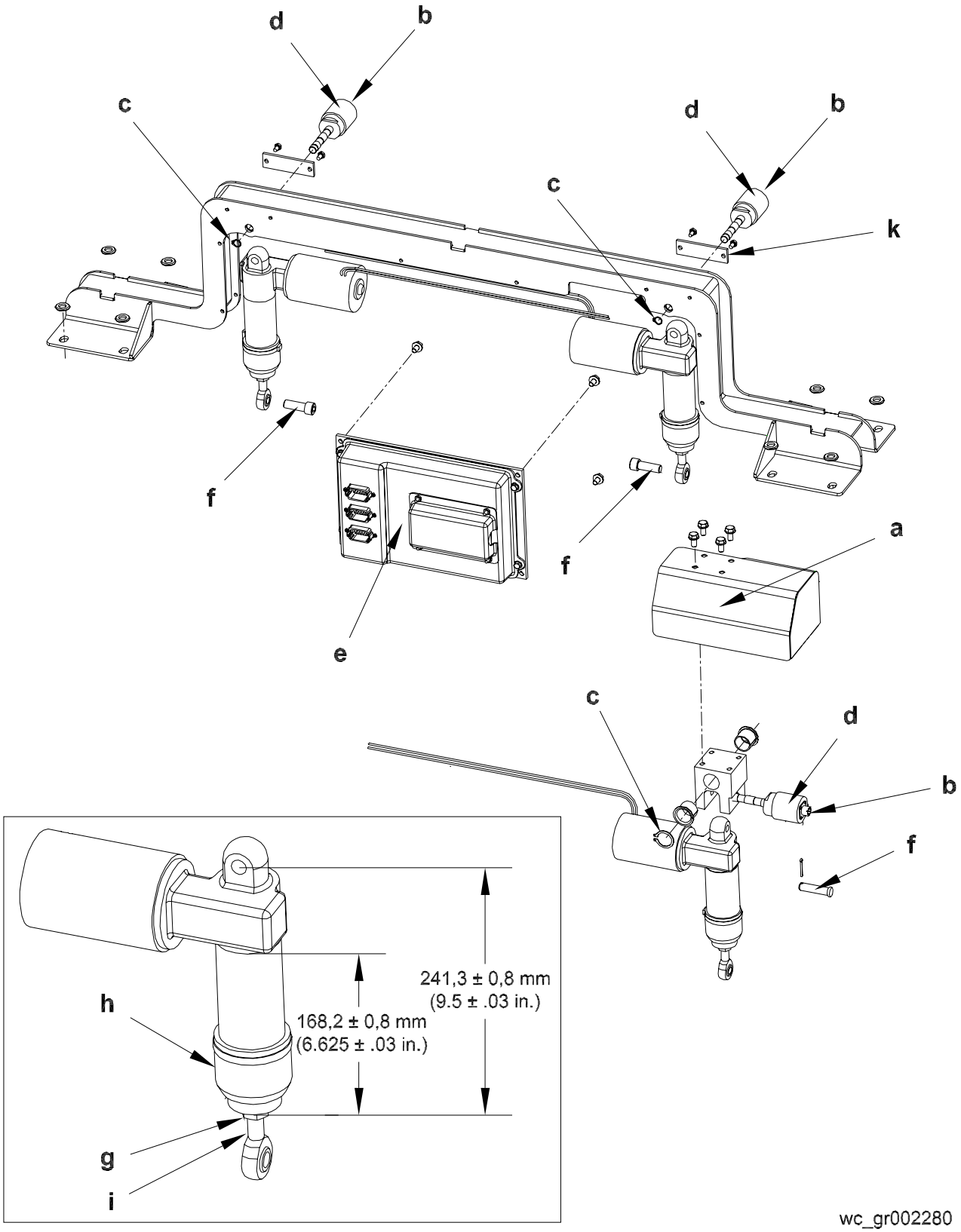
7.4.9 Rotate load pin **(d)** so the smaller alignment flat engages the locking plate **(k)**.

7.4.10 Install load pin retaining snap ring **(c)**. Make sure the snap ring is fully engaged into the shaft groove. Check load pin for movement. It should NOT move in or out.

7.4.11 Connect load pin wiring connector **(b)**.

7.4.12 Install protective cover **(a)** on rear actuator, if removed.

7.4.13 Lower seat assembly.


d
b
c
d
b
c
k
f
f
a
e
c
d
b
f
241,3 ± 0,8 mm
(9.5 ± .03 in.)
168,2 ± 0,8 mm
(6.625 ± .03 in.)
h
g
i
wc_gr002280

7.5 Removal and Installation of Electric Steering Actuators

See Graphic: wc_gr002280

Removal:

7.5.1 Turn ignition key to the “OFF” position.

7.5.2 Flip seat assembly forward. Make sure seat lock engages.

7.5.3 Disconnect actuator motor wiring harness **(e)** and load pin wiring connector **(b)**.

7.5.4 Remove lower actuator mounting bolt or pin **(f)**.

7.5.5 Remove the load pin retaining snap ring **(c)**.

7.5.6 Support the actuator motor and carefully remove the load pin **(d)**. Remove the actuator from the mount.

Installation:

Note: *Actuator length should be checked every time the actuator is removed from the machine.*

7.5.7 If actuator was removed, adjust actuator length before installation. Loosen locknut **(g)** and rotate barrel **(h)** clockwise until it stops retracting.

7.5.8 Rotate barrel **(h)** counter-clockwise to achieve dimension shown in graphic.

7.5.9 Align actuator motor mounting hole and carefully insert the load pin **(d)**.

7.5.10 Rotate load pin **(d)** so the smaller alignment flat engages the locking plate **(k)**.

7.5.11 Install load pin retaining snap ring **(c)**. Make sure the snap ring is fully engaged into the shaft groove. Check load pin for movement. It should NOT move in or out.

7.5.12 With the blades pitched flat and the trowel flat on ground, screw rod end **(i)** in or out to align hole with mounting hole in gearbox pivot rod. Hold barrel **(h)** so it does not rotate while adjusting rod end.

7.5.13 Apply medium strength thread-lock to mounting screw **(f)** and reinstall through rod end **(i)**. Torque to 77 ± 8 Nm (57 ± 6 ft.lbs.).

7.5.14 Apply medium strength thread-lock to the threads above the locknut **(g)** on the rod end **(i)**. Using band clamp or slip joint pliers around the barrel **(h)**, tighten locknut to 41 ± 7 Nm (30 ± 5 ft.lbs.).

7.5.15 Connect load pin connector **(b)** and actuator motor connector **(e)**. Reinstall any wiring fasteners removed.

7.5.16 Turn key to the “ON” position and test actuator function(s).

7.5.17 Lower seat assembly.

7.6 Removal and Installation of Electric Steering Joysticks

See Graphic: wc_gr002341

Removal:

7.6.1 Disconnect negative battery cable.

7.6.2 Remove the 4 screws from the side of the housing and lift off.

7.6.3 Unplug the joystick from the wiring harness.

7.6.4 Remove the 4 nuts, screws and washers retaining the joystick in the housing.

7.6.5 Lower the joystick and backing plate from the housing.

Installation:

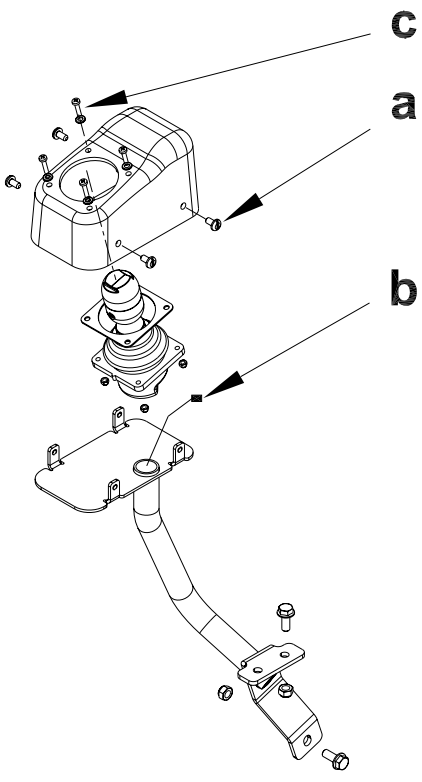
7.6.6 Position backing plate onto joystick.

7.6.7 Align joystick in housing and insert from bottom. Insert 4 screws with washers into top of housing and through backing plate. Install locknuts and tighten.

7.6.8 Carefully connect wiring harness into joystick.

7.6.9 Lower housing assembly onto mount. Apply medium strength thread-lock to the 4 screws and install.

7.6.10 Connect negative battery cable. Turn key to the “ON” position and check joystick function.



wc_gr002341

7.7 Removal and Installation of Electric Steer Control Board

Removal:

7.7.1 Make sure key switch is turned OFF.

7.7.2 Disconnect negative battery cable from battery.

7.7.3 Disconnect the gray and black control board connectors from the control board.

7.7.4 Remove the 4 nuts holding the wire cover on and remove the cover.

7.7.5 Check that the wires are labeled before removing them from the control board.

7.7.6 Remove the wires from the control board.

7.7.7 Remove the screws holding the control board onto the front panel and remove the board.

Installation:

7.7.8 Inspect control board. Make sure insulating strips are attached to the back of the board. DO NOT INSTALL BOARD WITHOUT THE INSULATORS INSTALLED! The back of the board has battery-positive terminals on it that may short without them.

7.7.9 Place a drop of medium strength thread-lock compound onto the mounting screws for the board and install. Torque to 10 Nm (7 ft.lbs.).

7.7.10 Install the motor control wires onto the terminals of the board. DO NOT OVERTIGHTEN.

7.7.11 Install the wire cover and tighten nuts.

7.7.12 Connect the gray connector to the gray receptacle and the black connector to the black receptacle on the control board.

7.7.13 Reconnect negative battery cable.

7.7.14 Turn key switch ON and test all control board functions.

Notes:

7.8 Electric Steer Error Code Diagnostics and Troubleshooting

See Graphic: wc_gr002279

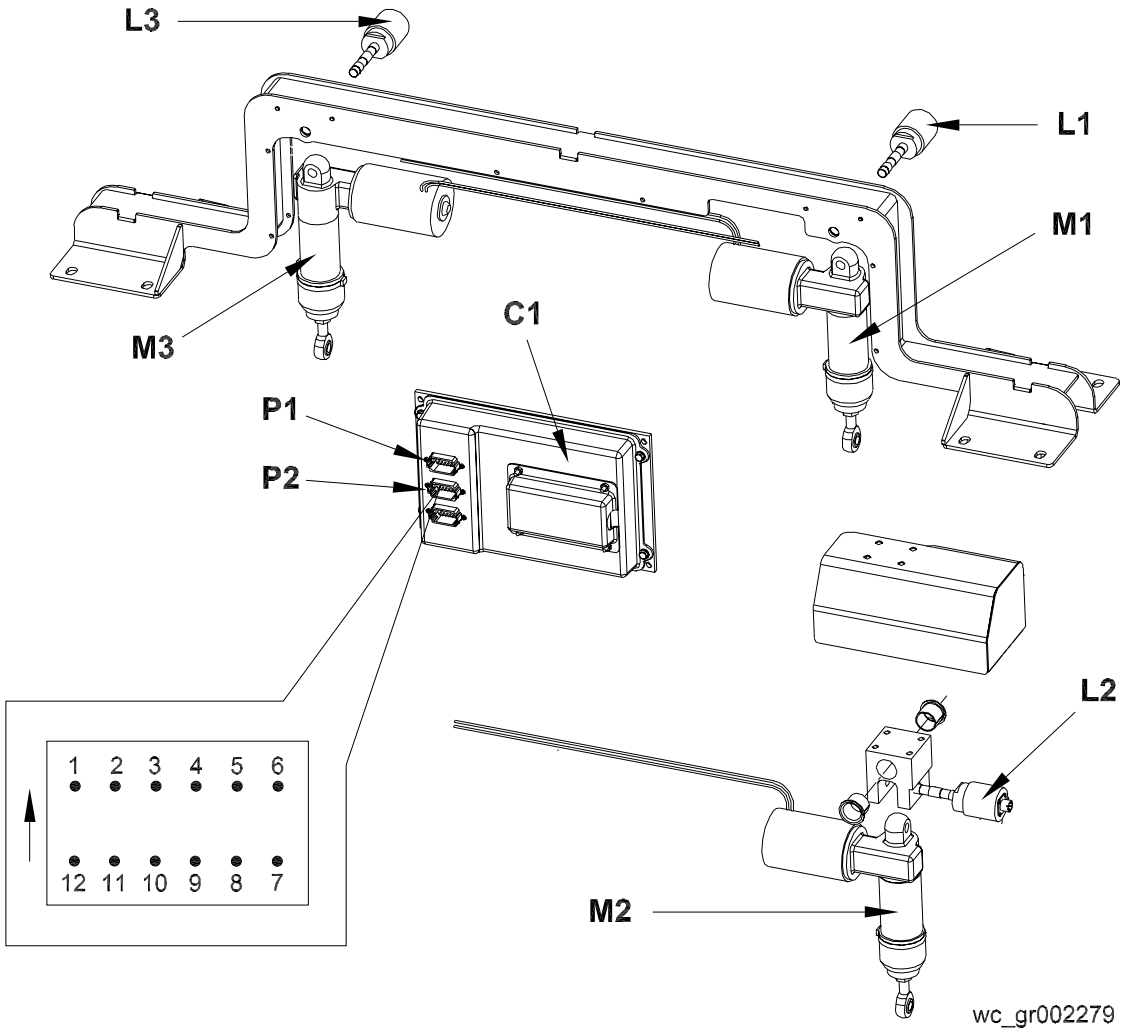
When an error code is displayed via the flashing red warning lamp the following steps should always be followed.

7.8.1 Turn ignition switch OFF. Turn ignition switch back ON and check the steering system functionality on all 3 circuits; right, side, and left. If error warning lamp is no longer flashing and the system is functional, no further action is required. If the lamp is still flashing, turn ignition switch OFF and proceed to next step.

7.8.2 Use a digital volt/ohm meter and check the static battery voltage. Voltage must be over 11 VDC. If the system voltage is 11 VDC or more, check the 70 amp Maxi-Fuse for the steering control system actuators. It is located under the seat pedestal above the relays and ignition module cover. If the voltage is under 11 volts, test and repair the charging system.

7.8.3 Turn ignition switch ON and allow system to initialize. Record the error code being displayed by the flashing red warning lamp. The lamp will show a long pause followed by 1 to 4 quick flashes, a short pause, 1 to 3 quick flashes, a short pause and 1 to 5 quick flashes. The sequence will repeat as long as there is a fault present. If the green lamp is flashing, the machine is in an “open loop” and this indicates a load pin fault. When the system goes into “open loop”, the load pins no longer provide feedback to the control board. The actuators are driven in or out by the joystick only. When the joystick is moved the actuator will move. The actuator does not return to the center position when the joystick is released, as it does in “closed loop”. The joystick must be used to move the actuator in the opposite direction.

7.8.4 Use the following troubleshooting guide to diagnose and repair the failure.



Ref.	Description	Ref.	Description
M1	Right actuator motor	**L1**	Right load pin
M2	Side actuator motor	**L2**	Side load pin
M3	Left actuator motor	**L3**	Left load pin
P1	Gray control board connector	**C1**	Control board
P2	Black control board connector		

Failure to follow the steps in this guide can cause irreparable damage to the electronic components in the steering system!

7.9 Error Code 111 - Right Actuator Fault

7.9.1 Perform a visual inspection of the right actuator wire connections and associated wiring. Inspect the mechanical parts to make sure no hardware is loose and the jam nut is tight. If no faults are found proceed to next step.

7.9.2 Turn ignition switch ON. Watch for movement of the right actuator when the right joystick is moved to full forward and full reverse positions. If there is little or erratic movement, turn ignition switch OFF. Inspect that the jam nut at the bottom of the actuator cylinder is tight. If the nut is loose it will have erratic or no movement as the drive barrel will spin on the threaded rod end. See section *Removal and Installation of Electric Steering Actuators* to replace actuator. If the jam nut is tight, proceed to next step.

7.9.3 Disconnect the wire connector labeled **M1** at the actuator. Use a digital volt/ohm meter, check actuator motor resistance at the motor wire connector. The motor resistance should be 0.2-1.0 ohms. If the reading is higher than 1.0 ohms, replace the right actuator motor. If there was no actuator movement, the jam nut was tight, and the motor resistance is correct, proceed to next step.

7.9.4 Be certain the ignition switch is turned OFF. Connect the black lead of the digital volt/ohm meter to the battery ground on the right rear frame of the machine. Set the meter to the DC voltage scale and check terminals of the wiring harness side of the **M1** connector. The orange and the black wires should read battery voltage with the ignition switch OFF. Turn ignition switch ON and check the wires again. With the right joystick in the centered position, the meter should read 0 volts. Connect to the orange wire and move the right joystick to the full forward, back to center and to full reverse positions. The meter should read battery voltage in one direction but read 0 VDC in the center and opposite positions. Perform the same test on the black wire, readings should be reversed. Proceed to next step.

7.9.5 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M3** actuator motor. Cut the wire ties so the wiring harness side of the **M3** connector can be connected to the **M1** actuator motor.

Do not connect the **M1** wiring harness to the **M3** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the left joystick forward/back while watching the right actuator for movement. The control system will go into “open loop” as at this time there is no load pin feedback and the green lamp should flash. The right actuator must move in and out with corresponding left joystick movements. Turn ignition switch OFF. Disconnect the **M3** wiring harness from the **M1** actuator motor and move the harness back to its original position. If the right actuator did not move, replace the right actuator. If the right actuator moved, proceed to next step.

7.9.6 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M1** actuator motor. Cut the wire ties so the wiring harness side of the **M1** connector can be connected to the **M3** actuator motor.

Do not connect the **M3** wiring harness to the **M1** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the right joystick forward/back watching the left actuator for movement. The control system will go into “open loop” at this time as there is no load pin feedback, and the green lamp should flash. The left actuator must move in and out with corresponding right joystick movements. Turn ignition switch OFF. Disconnect the **M3** wiring harness from the **M1** actuator motor and move the harness back to its original position. If the left actuator does not move, or only moves in one direction, replace the control board. Proceed to next step when all components have been restored to their original configuration.

7.9.7 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.10 Error Code 121 - Side Actuator Fault

7.10.1 Perform a visual inspection of the side actuator wire connections and associated wiring. Inspect the mechanical parts to make sure no hardware is loose and the jam nut is tight. If no faults are found proceed to next step.

7.10.2 Turn ignition switch ON. Watch for movement of the side actuator when the right joystick is moved to full left and right positions. If there is little or erratic movement turn ignition switch OFF. Ensure that the jam nut at the bottom of the actuator cylinder is tight. If the nut is loose it will have erratic or no movement as the drive barrel will spin on the threaded rod end. See section *Removal and Installation of Electric Steering Actuators* to replace actuator. If the jam nut was tight, proceed to next step.

7.10.3 Disconnect the wire connector labeled **M2** at the actuator. Using a digital volt/ohm meter, check actuator motor resistance at the motor wire connector. The motor resistance should be 0.2-1.0 ohms. If the reading is higher than 1.0 ohms, replace the actuator motor. If there is no actuator movement, the jam nut is tight, and the motor resistance is correct, proceed to next step.

7.10.4 Be certain the ignition switch is turned OFF. Connect the black lead of the digital volt/ohm meter to the battery ground on the right rear frame of the machine. Set the meter to the DC voltage scale and check terminals of the wiring harness side of the **M2** connector. The orange and the black wires should read battery voltage with the ignition switch OFF. Turn ignition switch ON and check both wires again. With the right joystick in the centered position, the meter should read 0 VDC. Connect to the orange wire and move the right joystick full left, back to the center and to full right positions. The meter should read battery voltage when the right joystick is moved in one direction but read 0 VDC in the center and opposite direction. Perform the same test on the black wire; readings should be reversed. Proceed to next step.

7.10.5 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M1** actuator motor. Cut the wire ties so the wiring harness side of the **M1** connector can be connected to the **M2** actuator motor.

Do not connect the **M2** wiring harness to the **M1** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the right joystick forward/back watching the side actuator for movement. The control system will go into “open loop” as at this time there is no load pin feedback and the green lamp should flash. The side actuator must move in and out with corresponding right joystick movements. Turn ignition switch OFF. Disconnect the **M1** wiring harness from the **M2** actuator motor and move the harness back to its original position. If the side actuator did not move, replace the side actuator. If the side actuator moved, proceed to next step.

7.10.6 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M2** actuator motor. Cut the wire ties so the wiring harness side of the **M2** connector can be connected to the **M1** actuator motor.

WARNING

Do not connect the **M1** wiring harness to the **M2** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the right joystick left/right watching the right actuator for movement. The control system will go into “open loop” as at this time there is no load pin feedback and the green lamp should flash. The right actuator must move in and out with corresponding right joystick movements. Turn ignition switch OFF. Disconnect the **M2** wiring harness from the **M1** actuator motor and move the harness back to its original position. If the right actuator did not move, or only moved in one direction, replace the control board. Proceed to next step when all components have been restored to their original configuration.

7.10.7 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.11 Error Code 131 - Left Actuator Fault

7.11.1 Perform a visual inspection of the left actuator wire connections and associated wiring. Inspect the mechanical parts to make sure no hardware is loose and the jam nut is tight. If no faults are found proceed to next step.

7.11.2 Turn ignition switch ON. Watch for movement of the left actuator when the left joystick is moved to full left and right positions. If there is little or erratic movement turn ignition switch OFF. Ensure that the jam nut at the bottom of the actuator cylinder is tight. If the nut is loose it will have erratic or no movement as the drive barrel will spin on the threaded rod end. See section *Removal and Installation of Electric Steering Actuators* to replace actuator. If the jam nut is tight, proceed to next step.

7.11.3 Disconnect the wire connector labeled **M3** at the actuator. Use a digital volt/ohm meter to check the actuator motor resistance at the motor wire connector. The motor resistance should be 0.2-1.0 ohms. If the reading is higher than 1.0 ohms, replace the actuator motor. If there was no actuator movement, the jam nut was tight, and the motor resistance tested correctly, proceed to next step.

7.11.4 Be certain the ignition switch is turned OFF. Connect the black lead of the digital volt/ohm meter to the battery ground on the right rear frame of the machine. Set the meter to the DC voltage scale and check the terminals of the wiring harness side of the **M3** connector. The orange and the black wires should read battery voltage with the ignition switch OFF. Turn ignition switch ON and check both wires again. With the left joystick in the centered position, the meter should read 0 VDC. Connect to the orange wire and move the left joystick to the full forward, back to center and to full reverse positions. The meter should read battery voltage when the left joystick is either moved in one direction but read 0 VDC in the center and opposite direction. Perform the same test on the black wire; readings should be reversed. Proceed to next step.

7.11.5 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M1** actuator motor. Cut the wire ties so the wiring harness side of the **M1** connector can be connected to the **M3** actuator motor.

Do not connect the **M3** wiring harness to the **M1** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the right joystick forward/back while watching the left actuator for movement. The control system will go into “open loop” as at this time there is no load pin feedback and the green lamp should flash. The left actuator must move in and out with corresponding right joystick movements. Turn ignition switch OFF. Disconnect the **M1** wiring harness from the **M3** actuator motor and move the harness back to its original position. If the left actuator did not move, replace the left actuator. If the left actuator moved, proceed to next step.

7.11.6 Be certain the ignition switch is turned OFF. Disconnect the motor connector from the **M3** actuator motor. Cut the wire ties so the wiring harness side of the **M3** connector can be connected to the **M1** actuator motor.

WARNING

Do not connect the **M1** wiring harness to the **M3** motor at this time! Doing so can cause irreparable damage to the electronic components in the steering system!

Turn ignition switch ON. Move the left joystick forward/back watching the right actuator for movement. The control system will go into “open loop” as at this time there is no load pin feedback and the green lamp should flash. The right actuator must move in and out with corresponding left joystick movements. Turn ignition switch OFF. Disconnect the **M3** wiring harness from the **M1** actuator motor and move the harness back to its original position. If the right actuator did not move, or only moved in one direction, replace the control board. Proceed to next step when all components have been restored to their original configuration.

7.11.7 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.12 Error Code 211 - Right Load Pin Open Circuit

7.12.1 Check the right load pin **L1** wire connections. Perform a visual inspection of the right load pin **L1** and associated wiring. If no faults are found proceed to next step.

7.12.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #1 terminal at the black **P2** connector. The meter should read that there is battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #2 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If no voltage is present, replace the right load pin **L1**. If voltage is present, move the meter ground lead to terminal #3 of the black **P2** connector. Move the red meter lead to terminal #1 of the black **P2** connector. The meter should read battery voltage. If no voltage is present, keep the black meter lead inserted in terminal #3 and move the red meter lead to the alternator battery terminal. The meter should read battery voltage. If voltage is present, replace the right load pin **L1**. If no voltage is present, replace the control board.

7.12.3 After replacing the failed component be sure to reposition the wiring harnesses in the correct configuration and retain the harnesses. Turn the ignition switch to ON and test the functionality of all 3 circuits: right, left, and side.

7.13 Error Code 212 - Right Load Pin Short Circuit

7.13.1 Check the right load pin **L1** wire connections. Perform a visual inspection of the right load pin **L1** and associated wiring. If no faults are found proceed to next step.

7.13.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #1 terminal at the black **P2** connector. The meter should read battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #2 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the right load pin **L1**. If the correct voltage is present, insert the red meter lead in terminal #3 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, proceed to next step.

7.13.3 Turn ignition switch OFF. Remove the black **P2** connector from the control board. Remove the orange locking plug from the front of the connector. Use a small screwdriver to release the locking tab and remove terminal #3 from the connector. Be sure to isolate the terminal from any metal surface. Install the orange locking plug and reinstall the connector. Turn ignition switch ON. Connect the red lead of the meter to the black wire from terminal #3. If voltage is present, replace the right load pin **L1**. If no voltage is present, insert the red meter lead in terminal #3 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, replace the control board. Be sure to reinstall terminal #3 into the black **P2** connector, Reverse procedure to install.

7.13.4 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits: right, left, and side.

7.14 Error Code 221 - Side Load Pin Open Circuit

7.14.1 Check the side load pin **L2** wire connections. Perform a visual inspection of the side load pin **L2** and associated wiring. If no faults are found proceed to next step.

7.14.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #4 terminal at the black **P2** connector. The meter should read battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #5 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If no voltage is present, replace the side load pin **L2**. If voltage is present, move the meter ground lead to terminal #6 of the black **P2** connector. Move the red meter lead to terminal #4 of the black **P2** connector. The meter should read battery voltage. If no voltage is present, keep the black meter lead inserted in terminal #6 and move the red meter lead to the alternator battery terminal. The meter should read battery voltage. If voltage is present, replace the side load pin **L2**. If no voltage is present, replace the control board.

7.14.3 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.15 Error Code 222 - Side Load Pin Short Circuit

7.15.1 Check the side load pin **L2** wire connections. Perform a visual inspection of the side load pin **L2** and associated wiring. If no faults are found proceed to next step.

7.15.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn the ignition switch to the ON position. Connect the black meter lead to a common ground. With the red meter lead, back probe the #4 terminal at the black **P2** connector. The meter should read battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #5 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the side load pin **L2**. If the correct voltage is present, insert the red meter lead in terminal #6 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, proceed to next step.

7.15.3 Turn ignition switch OFF. Remove the black **P2** connector from the control board. Remove the orange locking plug from the front of the connector. Use a small screwdriver to release the locking tab and remove terminal #6 from the connector. Be sure to isolate the terminal from any metal surface. Install the orange locking plug and reinstall the connector. Turn ignition switch ON. Connect the red lead of the meter to the black wire from terminal #6. If voltage is present replace the side load pin **L2**. If no voltage is present, insert the red meter lead in terminal #6 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, replace the control board. Be sure to reinstall terminal #6 into the black **P2** connector, reverse the removal procedure to install.

7.15.4 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.16 Error Code 231 - Left Load Pin Open Circuit

7.16.1 Check the left load pin **L3** wire connections. Perform a visual inspection of the left load pin **L3** and associated wiring. If no faults are found proceed to next step.

7.16.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #7 terminal at the black **P2** connector. The meter should read battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #8 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the left joystick in the centered position. If no voltage is present, replace the left load pin **L3**. If voltage is present, move the meter ground lead to terminal #9 of the black **P2** connector. Move the red meter lead to terminal #7 of the black **P2** connector. The meter should read battery voltage. If no voltage is present, keep the black meter lead inserted in terminal #9 and move the red meter lead to the alternator battery terminal. The meter should read battery voltage. If voltage is present, replace the left load pin **L3**. If no voltage is present replace the control board.

7.16.3 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.17 Error Code 232 - Left Load Pin Short Circuit

7.17.1 Check the left load pin **L3** wire connections. Perform a visual inspection of the left load pin **L3** and associated wiring. If no faults are found proceed to next step.

7.17.2 Use a digital volt/ohm meter to test for voltage at the black **P2** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #7 terminal at the black **P2** connector. The meter should read battery voltage. If no voltage is present, replace the control board. If voltage is present, back probe the #8 terminal at the black **P2** connector. The meter should read 2.5 +/- .2 VDC with the left joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the left load pin **L3**. If the correct voltage is present, insert the red meter lead in terminal #9 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, proceed to next step.

7.17.3 Turn ignition switch OFF. Remove the black **P2** connector from the control board. Remove the orange locking plug from the front of the connector. Use a small screwdriver to release the locking tab and remove terminal #9 from the connector. Be sure to isolate the terminal from any metal surface. Install the orange locking plug and reinstall the connector. Turn ignition switch ON. Connect the red lead of the meter to the black wire from terminal #9. If voltage is present replace the left load pin **L3**. If no voltage is present, insert the red meter lead in terminal #9 of the black **P2** connector. The meter should read 0 VDC. If voltage is present, replace the control board. Be sure to reinstall terminal #9 into the black **P2** connector, reverse the removal procedure to install.

7.17.4 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.18 Error Code 311 - Right Joystick Open Circuit

7.18.1 Check the right joystick wire connections. Perform a visual inspection of the right joystick and associated wiring. If no faults are found proceed to next step.

7.18.2 Use a digital volt/ohm meter to test for voltage at the gray **P1** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #2 terminal at the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, replace the control board. If voltage is present, back probe the #3 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If no voltage is present, replace the right joystick. If voltage is present, back probe the #4 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If no voltage is present, replace the right joystick. If voltage is present, move the meter ground lead to terminal #6 of the gray **P1** connector. Move the red meter lead to terminal #2 of the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, keep the black meter lead inserted in terminal #6 and move the red meter lead to the alternator battery terminal. The meter should read battery voltage. If voltage is present, replace the right joystick. If no voltage is present, replace the control board.

7.18.3 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.19 Error Code 312 - Right Joystick Short Circuit

7.19.1 Check the right joystick wire connections. Perform a visual inspection of the right joystick and associated wiring. If no faults are found proceed to next step.

7.19.2 Use a digital volt/ohm meter to test for voltage at the gray **P1** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #2 terminal at the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, replace the control board. If voltage is present, back probe the #3 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the right joystick. If the correct voltage is present, back probe the #4 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the right joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the right joystick. If the correct voltage is present, insert the red meter lead in terminal #5 of the gray **P1** connector. The meter should read 0 VDC. If voltage is present, proceed to next step.

7.19.3 Turn ignition switch OFF. Remove the gray **P1** connector from the control board. Remove the orange locking plug from the front of the connector. Use a small screwdriver to release the locking tab and remove terminal #5 from the connector. Be sure to isolate the terminal from any metal surface. Install the orange locking plug and reinstall the connector. Turn ignition switch ON. Connect the red lead of the meter to the black wire from terminal #5. There should be no voltage present. If voltage is present, replace the right joystick. If no voltage is present, insert the red meter lead in terminal #5 of the gray **P1** connector. The meter should read 0 VDC. If voltage is present, replace the control board. Be sure to reinstall terminal #5 into the gray **P1** connector, reverse the removal procedure to install.

7.19.4 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.20 Error Code 321 - Left Joystick Open Circuit

7.20.1 Check the left joystick wire connections. Perform a visual inspection of the left joystick and associated wiring. If no faults are found proceed to next step.

7.20.2 Use a digital volt/ohm meter to test for voltage at the gray **P1** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #7 terminal at the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, replace the control board. If voltage is present, back probe the #8 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the left joystick in the centered position. If no voltage is present, replace the left joystick. If voltage is present, move the meter ground lead to terminal #10 of the gray **P1** connector. Move the red meter lead to terminal #8 of the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, keep the black meter lead inserted in terminal #10 and move the red meter lead to the alternator battery terminal. The meter should read battery voltage. If voltage is present, replace the left joystick. If no voltage is present, replace the control board.

7.20.3 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn ignition switch ON and test the functionality of all 3 circuits; right, left, and side.

7.21 Error Code 322 - Left Joystick Short Circuit

7.21.1 Check the left joystick wire connections. Perform a visual inspection of the left joystick and associated wiring. If no faults are found proceed to next step.

7.21.2 Use a digital volt/ohm meter to test for voltage at the gray **P1** control board connector. Turn ignition switch ON. Connect the black meter lead to a common ground. With the red meter lead, back probe the #7 terminal at the gray **P1** connector. The meter should read 5 VDC. If no voltage is present, replace the control board. If voltage is present, back probe the #8 terminal at the gray **P1** connector. The meter should read 2.5 +/- .2 VDC with the left joystick in the centered position. If the meter reads over 2.5 +/- .2 VDC, replace the left joystick. If the correct voltage is present, insert the red meter lead in terminal #10 of the gray **P1** connector. The meter should read 0 VDC. If voltage is present, proceed to next step.

7.21.3 Turn ignition switch OFF. Remove the gray **P1** connector from the control board. Remove the orange locking plug from the front of the connector. Use a small screwdriver to release the locking tab and remove terminal #10 from the connector. Be sure to isolate the terminal from any metal surface. Install the orange locking plug and reinstall the connector. Turn ignition switch ON. Connect the red lead of the meter to the black wire from terminal #10. If voltage is present, replace the left joystick. If no voltage is present, insert the red meter lead in terminal #10 of the gray **P1** connector. The meter should read 0 VDC. If voltage is present, replace the control board. Be sure to reinstall terminal #5 into the gray **P1** connector, reverse the removal procedure to install.

7.21.4 After replacing the failed component make sure to reposition the wiring harnesses in the correct configuration and secure with wire ties. Turn the ignition switch to ON and test the functionality of all 3 circuits; right, left, and side.

7.22 Error Code 414 - Control Board Over Temperature

7.22.1 Shut down machine and allow control board to cool to ambient temperature. Inspect area surrounding control board and remove any accumulated debris. After machine has cooled attempt to run machine. If error code reappears replace the control board.

7.23 Error Code 415 - Low Battery Voltage

7.23.1 Inspect battery and all associated wiring. Remove all corrosion from battery terminals. Inspect actuator wiring at control board and remove all corrosion. Test the two 70 amp Maxi Fuses, one under the seat pedestal and one inside the battery box. Battery voltage must be above 11 VDC. Load test battery and replace if needed. Test alternator output and replace if needed. The alternator is rated at 65 amps.

8. Engine

8.1 Engine Removal and Installation-Kohler or Honda Engine

See Graphic: wc_gr002098

Removal:

8.1.1 Remove 4 nuts to remove cross brace.

8.1.2 Disconnect battery.

8.1.3 Close fuel valve on fuel tank.

8.1.4 Disconnect fuel line at fuel pump.

8.1.5 Unplug main engine harness **(a)**.

8.1.6 Unplug single black wire from engine harness.

8.1.7 Unplug single white wire from engine harness.

8.1.8 Unplug single yellow to pink/purple/orange wires.

8.1.9 Cut tie wraps, and disconnect relay **(b)**.

8.1.10 Remove battery terminal nut from starter **(c)**.

8.1.11 Remove battery cable **(d)**.

8.1.12 Remove auxiliary power cable **(e)**.

8.1.13 Remove cotter pin **(f)** from throttle cable connection.

8.1.14 Loosen up throttle mounting nuts.

8.1.15 Lift throttle cable free.

8.1.16 Remove air filter cover and filter.

8.1.17 Close choke **(g)** and remove 3 bolts from air cleaner base and lift off.

8.1.18 Remove 2 wires from oil switch (grey and red).

8.1.19 Loosen screw for choke cable and remove cable.

8.1.20 Loosen 4 engine mounting bolts from under engine.

8.1.21 Push engine forward to remove belt from primary clutch.

8.1.22 Remove engine using the lifting eye.

Installation:

8.1.23 Install engine using the lifting eye.

8.1.24 Attach belt to primary clutch and push engine back.

8.1.25 Replace 4 engine mounting bolts from under engine. Torque to 49 Nm (36 ft.lbs.).

8.1.26 Attach choke cable and tighten screw for choke cable.

8.1.27 Attach 2 wires to oil switch (grey and red).

8.1.28 Replace air cleaner base and attach with 3 bolts. Torque to 9.9 Nm (88 in. lbs.). Open choke **(g)**.

8.1.29 Install air filter and cover.

8.1.30 Replace throttle cable.

8.1.31 Tighten up throttle mounting nuts.

8.1.32 Install cotter pin **(f)** from throttle cable connection.

8.1.33 Attach auxiliary power cable **(e)**.

8.1.34 Attach battery cable **(d)**.

8.1.35 Attach and tighten battery terminal nut **(c)** to starter.

8.1.36 Connect relay **(b)** and replace tie wrap.

8.1.37 Plug in single yellow to pink/purple/orange wires.

8.1.38 Plug in single white wire to engine harness.

8.1.39 Plug in single black wire to engine harness.

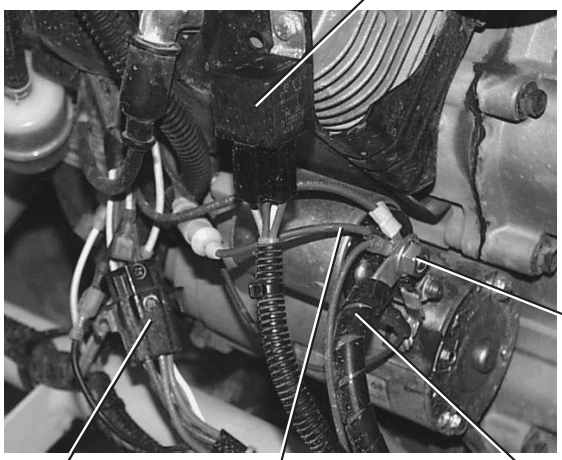
8.1.40 Plug in main engine harness **(a)**.

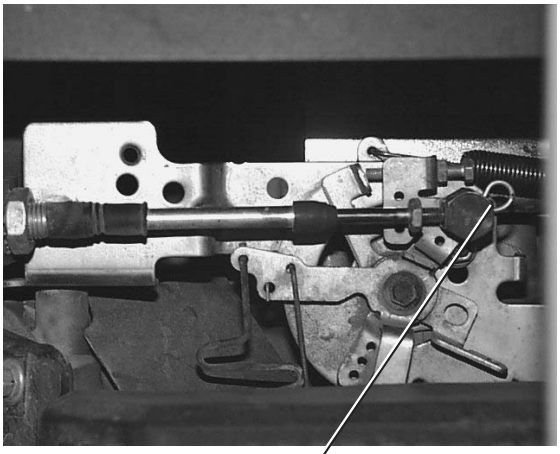
8.1.41 Connect fuel line at fuel pump.

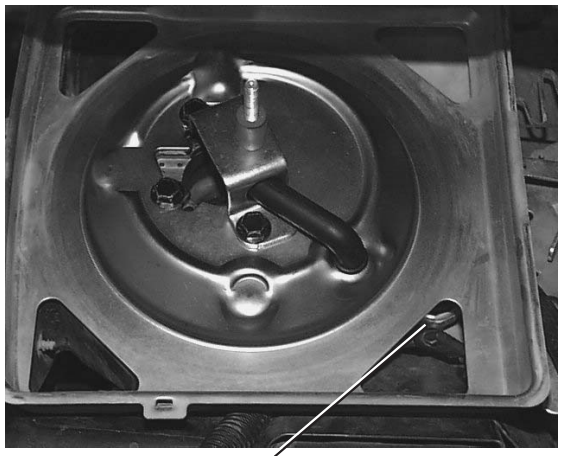
8.1.42 Open fuel valve on fuel tank.

8.1.43 Connect battery.

8.1.44 Apply Loctite 243 to bolts and install cross brace. Torque to 25 Nm (18 ft.lbs.).







wc_gr002098

8.2 Engine Removal and Installation-Vanguard Engine

See Graphic: wc_gr002079

Removal:

8.2.1 Disconnect battery.

8.2.2 Lift trowel. Attach a slings or chains through the lifting bars on each side of the seat pedestal.

CAUTION: Make sure the lifting device has enough weight bearing capacity to lift machine safely. Refer to Section *Technical Data.*

DO NOT lift the trowel by the guard rings or any part of the trowel other than the lifting fixture, as the component may fail, causing the trowel to fall, possibly injuring bystanders.

8.2.3 While trowel is lifted remove the 6 bolts holding on the splash pan. Remove only the two shockmount nuts located under the engine.

8.2.4 Set trowel down on a flat surface.

8.2.5 Remove 2 bolts and remove cross brace.

8.2.6 Close fuel valve on fuel tank.

8.2.7 Unplug the 6 ignition secondary wires **(a)**.

8.2.8 Unplug the oil pressure switch **(b)**.

8.2.9 Unplug the anti-backfire solenoid **(c)**.

8.2.10 Unplug the alternator output cable **(d)**.

8.2.11 Unplug the alternator control wire **(e)**.

8.2.12 Unplug the alternator sensor **(f)**.

8.2.13 Disconnect the fuel line **(g)** at the carburetor. Remove clamp from radiator shroud that holds the fuel line.

8.2.14 Disconnect the throttle and choke cables **(h)**.

8.2.15 Unplug the temperature sender wire **(i)**.

8.2.16 Cut tie wraps as needed.

8.2.17 Disconnect ground cable from right side of engine.

8.2.18 Remove battery positive cable **(k)** and stater wire **(l)**.

8.2.19 Remove the 4 bolts holding each inside universal joint to the shaft fitting. Remove universal joints and shims (if included) from ends of drive shaft.

8.2.20 Remove the remaining 3 shockmount nuts from the front and side of the engine base.

8.2.21 Lift and slide the engine back, using the lift brackets **(m)**.

Installation:

8.2.22 Lift and slide the engine into the frame of the machine, using the lift brackets **(m)**.

8.2.23 Apply Loctite 243 to the screws and install the 3 shockmount nuts into the front and side of the engine base. Torque to 25 Nm (18 ft.lbs.)

8.2.24 Install the universal joints and shims (if removed) to ends of drive shaft. Install the 4 bolts holding each inside universal joint to the shaft fitting. Torque to 17 Nm (12 ft.lbs.).

8.2.25 Attach battery positive cable **(k)** and stater wire **(l)**.

8.2.26 Connect ground cable to right side of engine.

8.2.27 Replace tie wraps as needed.

8.2.28 Connect the temperature sender wire **(i)**.

8.2.29 Connect the throttle and choke cable **(h)**.

8.2.30 Connect the fuel line **(g)** at the carburetor. Attach clamp to radiator shroud that holds the fuel line.

8.2.31 Plug in the alternator sensor **(f)**.

8.2.32 Plug in the alternator control wire **(e)**.

8.2.33 Attach the alternator output cable **(d)**.

8.2.34 Plug in the anti-backfire solenoid **(c)**.

8.2.35 Plug in the oil pressure switch **(b)**.

8.2.36 Plug in the 6 ignition secondary wires **(a)**.

8.2.37 Apply Loctite 243 to bolts and install cross brace. Torque to 25 Nm (18 ft.lbs.).

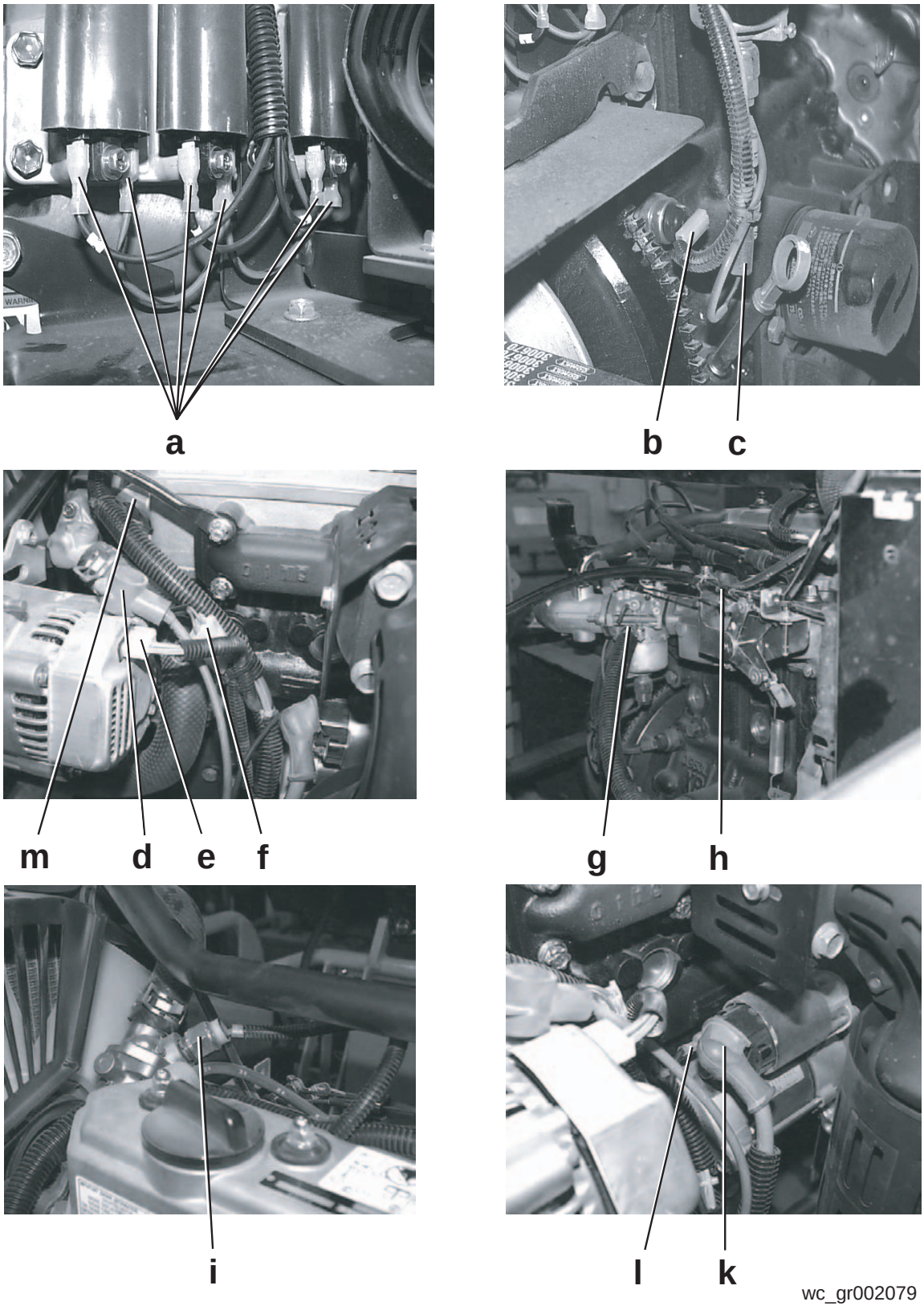
8.2.38 Lift trowel.

8.2.39 Apply Loctite 243 to the screws and install the remaining 2 shockmounts located under the engine. Torque to 25 Nm (18 ft.lbs.). While trowel is lifted install the 6 bolts holding on the splash pan. Torque to 25 Nm (18 ft.lbs.).

8.2.40 Set trowel down on a flat surface.

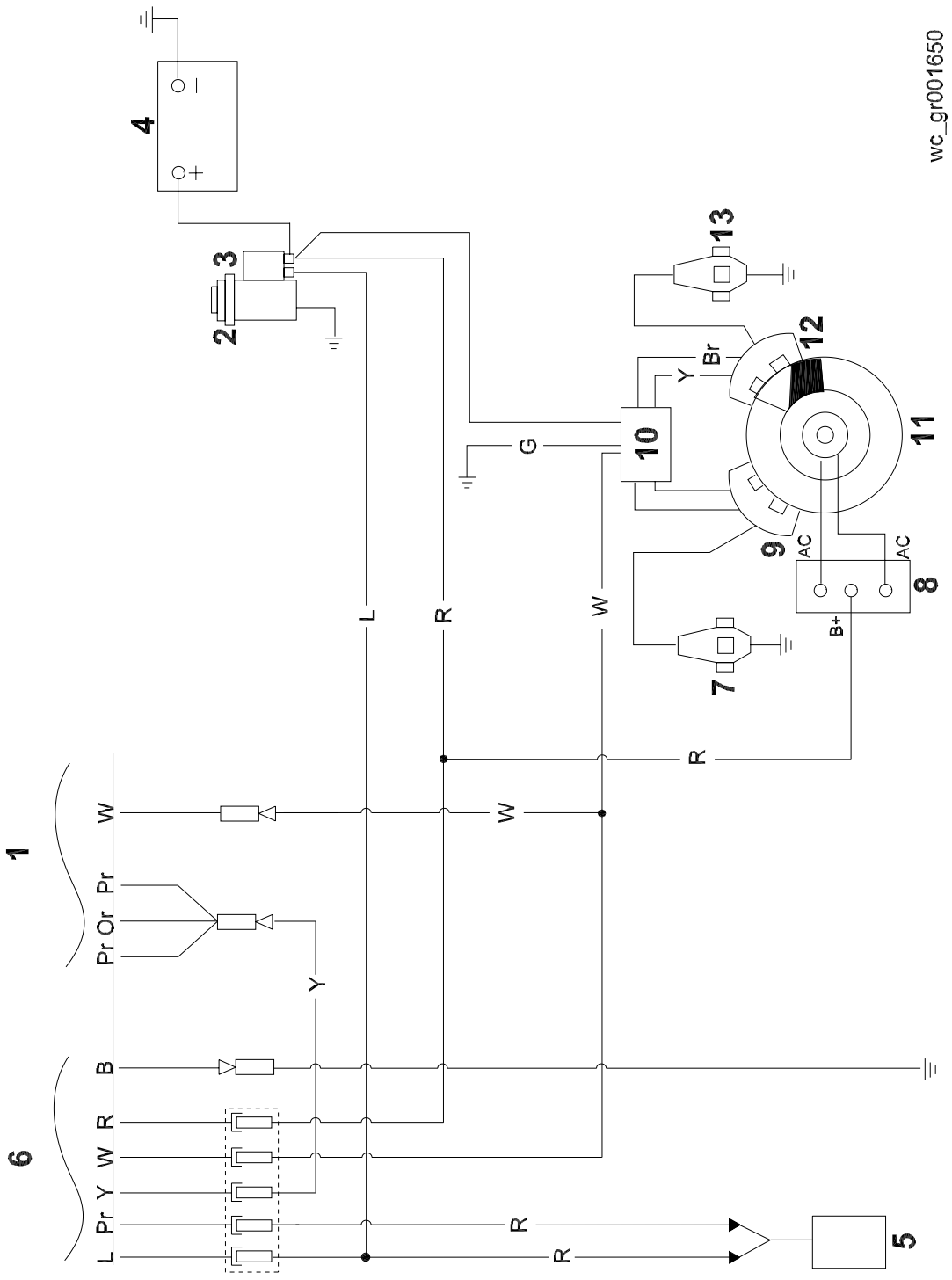
8.2.41 Open fuel valve on fuel tank.

8.2.42 Connect battery.



wc_gr002079

8.3 Wiring Schematic-Kohler

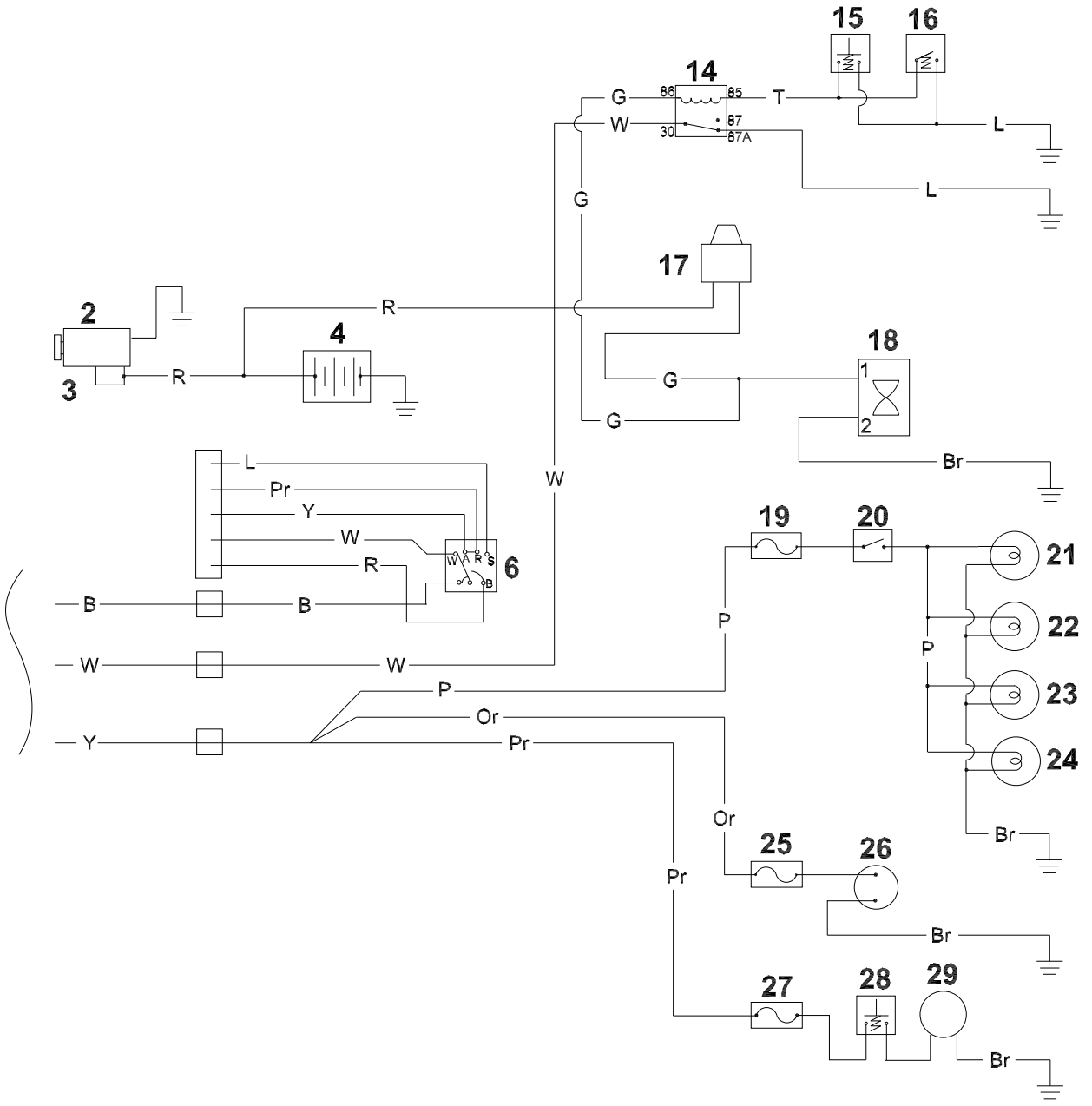


Kohler Motor

Ref.	Description	Ref.	Description
1	Wiring harness	16	Throttle sense switch (normally closed)
2	Starter	17	Low oil pressure switch (normally open)
3	Solenoid	18	Hour meter
4	Battery	19	Fuse 15A - Light circuit
5	Fuel cut-off solenoid	20	Light switch
6	Key switch	21	Left front light
7	Spark plug (left)	22	Left rear light
8	Regulator	23	Right front light
9	Coil-ignition (left)	24	Right rear light
10	Module, ignition	25	Fuse 20A - Accessory outlet
11	Alternator	26	Accessory outlet
12	Coil-ignition (right)	27	Fuse 5A - Spray system
13	Spark plug (right)	28	Spray pump switch
14	Relay - Safety system	29	Spray pump motor
15	Operator Presence switch (normally open)		

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

Kohler



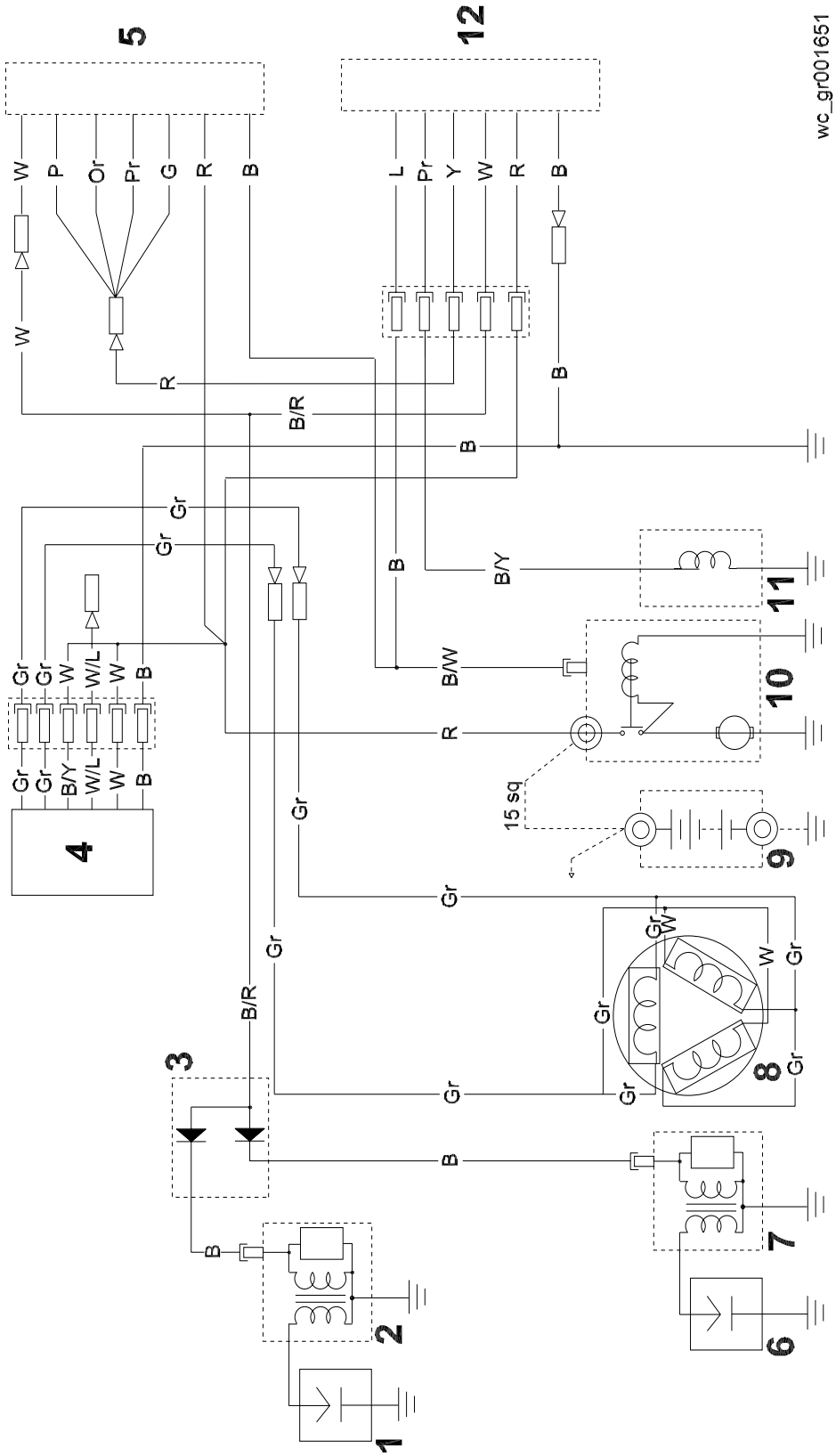
wc_gr001650a

Kohler Motor

Ref.	Description	Ref.	Description
1	Wiring harness	16	Throttle sense switch (normally closed)
2	Starter	17	Low oil pressure switch (normally open)
3	Solenoid	18	Hour meter
4	Battery	19	Fuse 15A - Light circuit
5	Fuel cut-off solenoid	20	Light switch
6	Key switch	21	Left front light
7	Spark plug (left)	22	Left rear light
8	Regulator	23	Right front light
9	Coil-ignition (left)	24	Right rear light
10	Module, ignition	25	Fuse 20A - Accessory outlet
11	Alternator	26	Accessory outlet
12	Coil-ignition (right)	27	Fuse 5A - Spray system
13	Spark plug (right)	28	Spray pump switch
14	Relay - Safety system	29	Spray pump motor
15	Operator Presence switch (normally open)		

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

8.4 Wiring Schematic-Honda

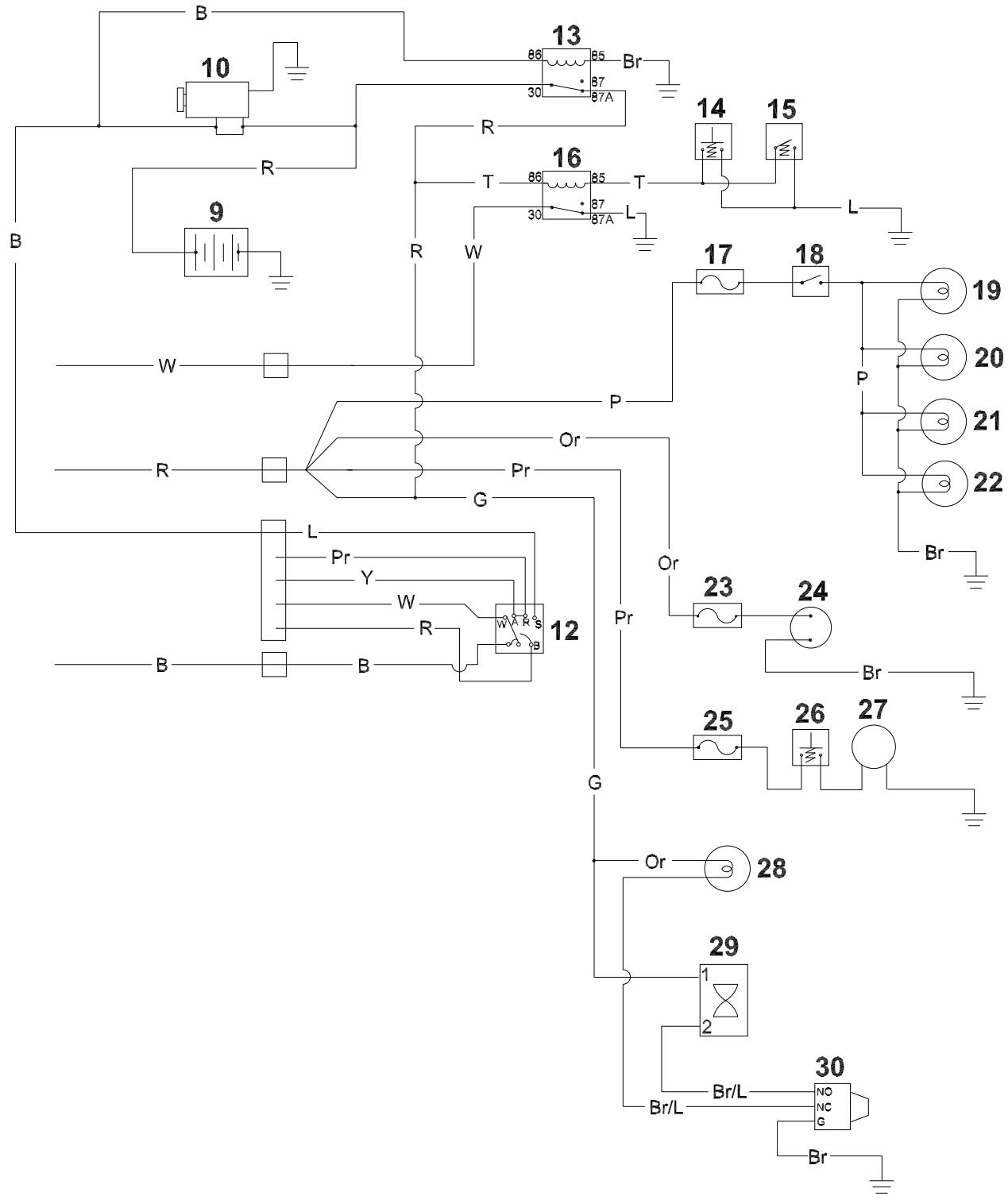


Honda Motor

Ref.	Description	Ref.	Description
1	Spark plug (right)	16	Relay - Safety system
2	Coil-ignition (right)	17	Fuse 15A - Light circuit
3	Engine Stop Diode	18	Light switch
4	Regulator/Rectifier	19	Left front light
5	Wiring harness	20	Left rear light
6	Spark plug (left)	21	Right front light
7	Coil-ignition (left)	22	Right rear light
8	Charging Coil - 20 Amp	23	Fuse 20A - Accessory outlet
9	Battery	24	Accessory outlet
10	Starter Motor	25	Fuse 5A - Spray system
11	Fuel cut-off solenoid	26	Spray pump switch
12	Key switch	27	Spray pump motor
13	Starter relay	28	Oil pressure indicator light
14	Operator Presence switch (normally open)	29	Hour meter
15	Throttle sense switch (normally closed)	30	Oil pressure switch (dual circuit)

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

Honda



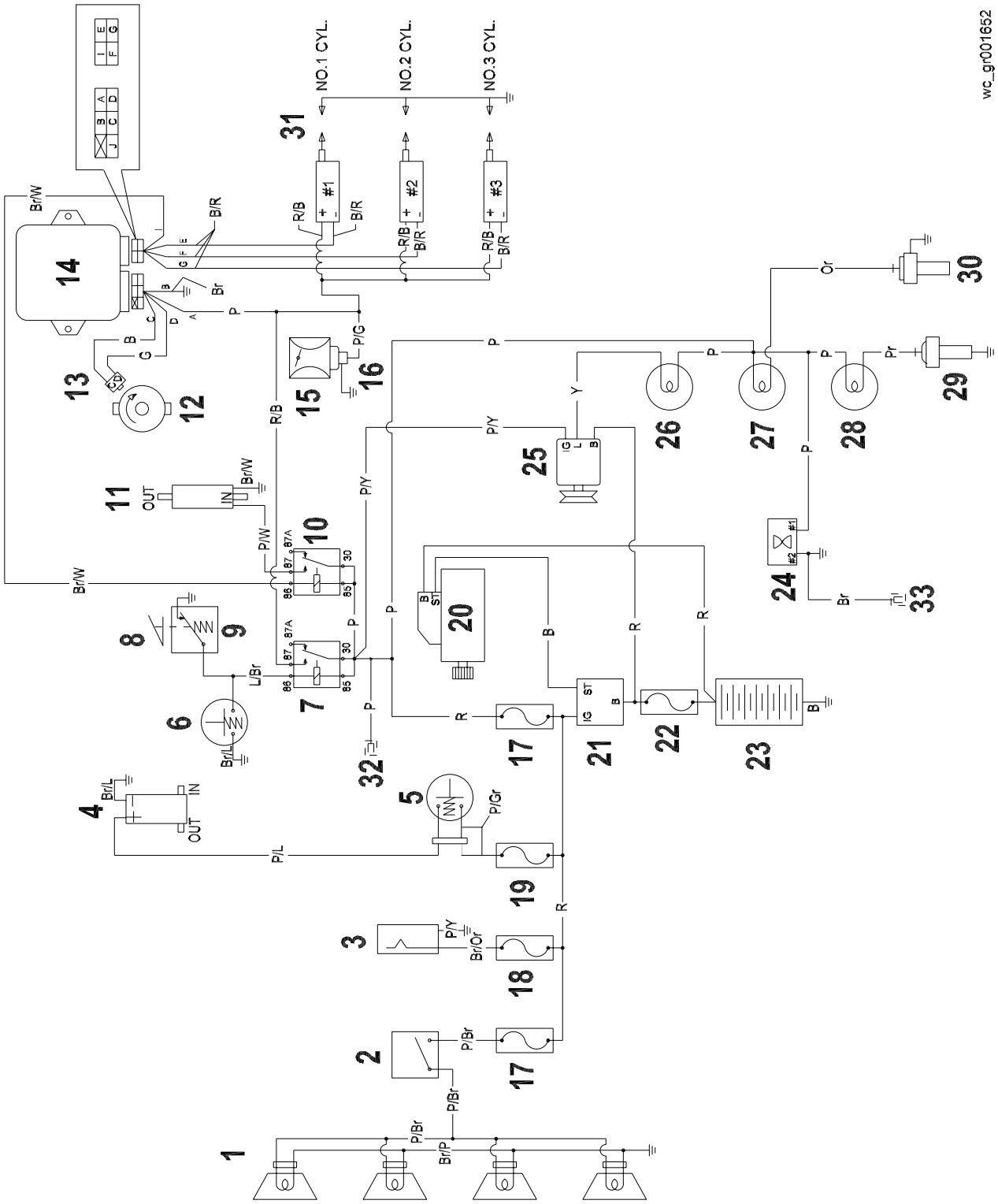
wc_gr001651a

Honda Motor

Ref.	Description	Ref.	Description
1	Spark plug (right)	16	Relay - Safety system
2	Coil-ignition (right)	17	Fuse 15A - Light circuit
3	Engine Stop Diode	18	Light switch
4	Regulator/Rectifier	19	Left front light
5	Wiring harness	20	Left rear light
6	Spark plug (left)	21	Right front light
7	Coil-ignition (left)	22	Right rear light
8	Charging Coil - 20 Amp	23	Fuse 20A - Accessory outlet
9	Battery	24	Accessory outlet
10	Starter Motor	25	Fuse 5A - Spray system
11	Fuel cut-off solenoid	26	Spray pump switch
12	Key switch	27	Spray pump motor
13	Starter relay	28	Oil pressure indicator light
14	Operator Presence switch (normally open)	29	Hour meter
15	Throttle sense switch (normally closed)	30	Oil pressure switch (dual circuit)

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

8.5 Wiring Schematic-Vanguard Engine (manual steer)

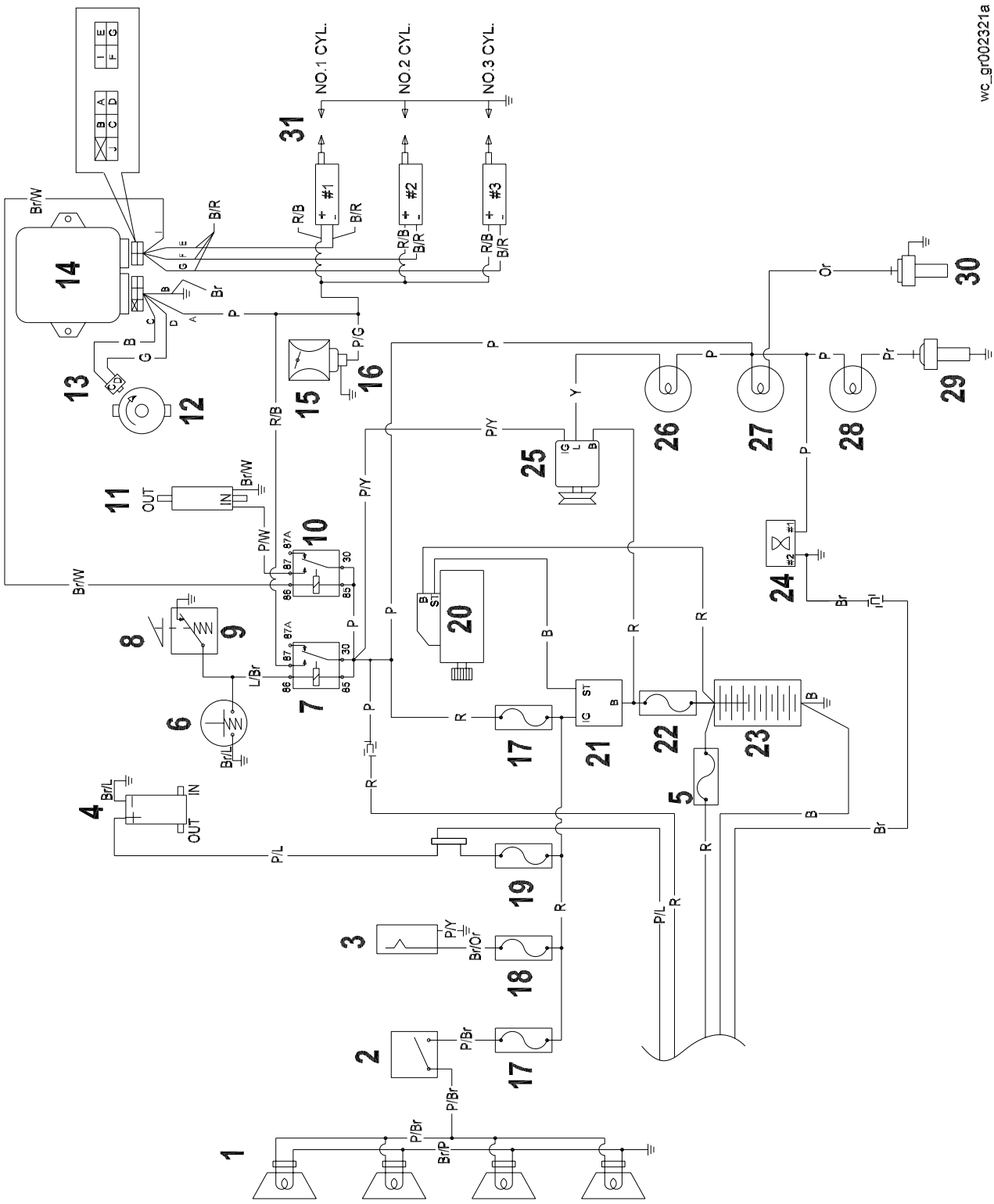


Vanguard Motor (manual steer)

Ref.	Description	Ref.	Description
1	Work lights	18	Fuse 20A
2	Light switch	19	Fuse 5A
3	DC accessory outlet	20	Starter
4	Water pump	21	Key switch
5	Sprayer pump switch	22	Fuse 50A
6	Seat switch (normally open)	23	Battery
7	Operator presence relay	24	Hour meter
8	Throttle pedal	25	Alternator
9	Throttle switch (normally closed)	26	Charging light
10	Fuel pump relay	27	Overheating warning light
11	Fuel pump	28	Oil pressure indicator light
12	Crankshaft pulley	29	Oil level switch
13	Trigger coil	30	Water temperature switch
14	Ignition module	31	Ignition coils
15	Carburetor	32	(not used)
16	Solenoid	33	(not used)
17	Fuse 15A		

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

8.6 Wiring Schematic-Vanguard Engine (electric steer)

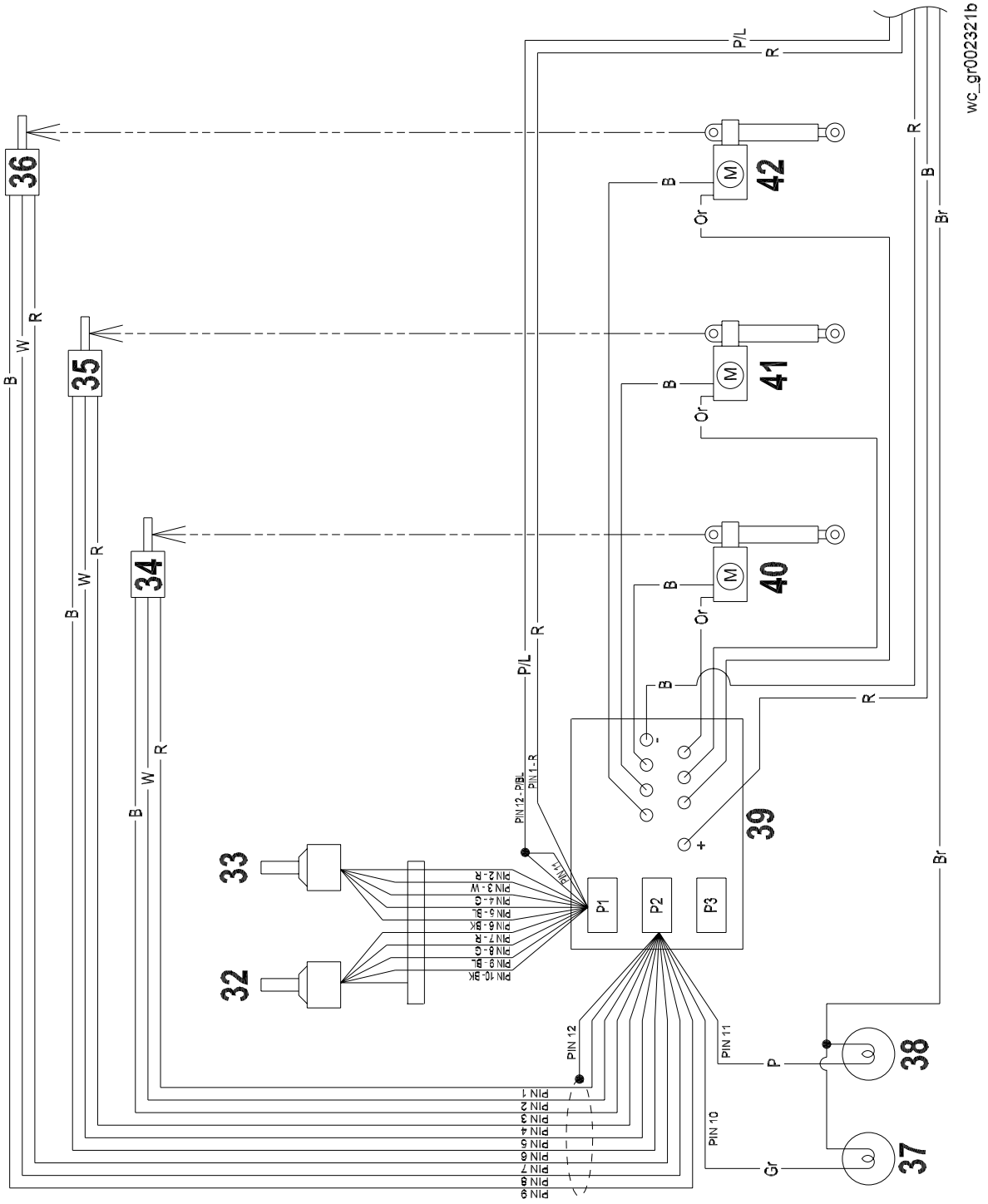


Vanguard Motor (electric steer)

Ref.	Description	Ref.	Description
1	Work lights	22	Fuse 50A
2	Light switch	23	Battery
3	DC accessory outlet	24	Hour meter
4	Water pump	25	Alternator
5	Fuse 70A	26	Charging light
6	Seat switch (normally open)	27	Overheating warning light
7	Operator presence relay	28	Oil pressure indicator light
8	Throttle pedal	29	Oil level switch
9	Throttle switch (normally closed)	30	Water temperature switch
10	Fuel pump relay	31	Ignition coils
11	Fuel pump	32	Left joystick
12	Crankshaft pulley	33	Right joystick
13	Trigger coil	34	Right load pin
14	Ignition module	35	Side load pin
15	Carburetor	36	Left load pin
16	Solenoid	37	Status OK indicator light (green)
17	Fuse 15A	38	Status error indicator light (red)
18	Fuse 20A	39	Electronic control module
19	Fuse 5A	40	Right actuator
20	Starter	41	Side actuator
21	Key switch	42	Left actuator

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

Vanguard (electric steer)



Vanguard Motor (electric steer)

Ref.	Description	Ref.	Description
1	Work lights	22	Fuse 50A
2	Light switch	23	Battery
3	DC accessory outlet	24	Hour meter
4	Water pump	25	Alternator
5	Fuse 70A	26	Charging light
6	Seat switch (normally open)	27	Overheating warning light
7	Operator presence relay	28	Oil pressure indicator light
8	Throttle pedal	29	Oil level switch
9	Throttle switch (normally closed)	30	Water temperature switch
10	Fuel pump relay	31	Ignition coils
11	Fuel pump	32	Left joystick
12	Crankshaft pulley	33	Right joystick
13	Trigger coil	34	Right load pin
14	Ignition module	35	Side load pin
15	Carburetor	36	Left load pin
16	Solenoid	37	Status OK indicator light (green)
17	Fuse 15A	38	Status error indicator light (red)
18	Fuse 20A	39	Electronic control module
19	Fuse 5A	40	Right actuator
20	Starter	41	Side actuator
21	Key switch	42	Left actuator

Wire Colors							
B	Black	R	Red	Y	Yellow	Or	Orange
G	Green	T	Tan	Br	Brown	Pr	Purple
L	Blue	V	Violet	Cl	Clear	Sh	Shield
P	Pink	W	White	Gr	Gray	LL	Light Blue

Notes:

Threadlockers and Sealants

Threadlocking adhesives and sealants are specified throughout this manual by a notation of “S” plus a number (S#) and should be used where indicated. Threadlocking compounds normally break down at temperatures above 175°C (350°F). If a screw or bolt is hard to remove, heat it using a small propane torch to break down the sealant. When applying sealants, follow instructions on container. The sealants listed below are recommended for use on Wacker equipment.

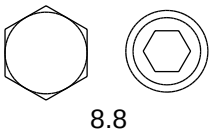
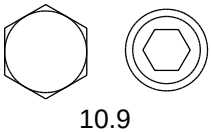
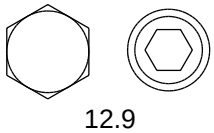
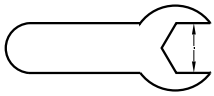
TYPE ( ) = Europe	COLOR	USAGE	PART NO. - SIZE
Loctite 222 Hernon 420 Omnifit 1150 (50M)	Purple	Low strength, for locking threads smaller than 6 mm (1/4"). Hand tool removable. Temp. range, -54 to 149°C (-65 to 300°F)	73287 - 10 ml
Hernon 423 Omnifit 1350 (100M)	Blue	Medium strength, for locking threads larger than 6 mm (1/4"). Hand tool removable. Temp. range, -54 to 149°C (-65 to 300°F)	29311 - .5 ml 17380 - 50 ml
Loctite 271/277 Hernon 427 Omnifit 1550 (220M)	Red	High strength, for all threads up to 25 mm (1”). Heat parts before disassembly. Temp. range, -54 to 149°C (-65 to 300°F)	29312 - .5 ml 26685 - 10 ml 73285 - 50 ml
Loctite 290 Hernon 431 Omnifit 1710 (230LL)	Green	Medium to high strength, for locking preassembled threads and for sealing weld porosity (wicking). Gaps up to 0.13 mm (0.005") Temp. range, -54 to 149°C (-65 to 300° F)	28824 - .5 ml 25316 - 10 ml
Loctite 609 Hernon 822 Omnifit 1730 (230L)	Green	Medium strength retaining compound for slip or press fit of shafts, bearings, gears, pulleys, etc. Gaps up to 0.13 mm (0.005") Temp. range, -54 to 149°C (-65 to 300°F)	29314 - .5 ml
Loctite 545 Hernon 947 Omnifit 1150 (50M)	Brown	Hydraulic sealant Temp. range, -54 to 149°C (-65 to 300°F)	79356 - 50 ml
Loctite 592 Hernon 920 Omnifit 790	White	Pipe sealant with Teflon for moderate pressures. Temp. range, -54 to 149°C (-65 to 300°F)	26695 - 6 ml 73289 - 50 ml
Loctite 515 Hernon 910 Omnifit 10	Purple	Form-in-place gasket for flexible joints. Fills gaps up to 1.3 mm (0.05") Temp. range, -54 to 149°C (-65 to 300°F)	70735 - 50 ml
Loctite 496 Hernon 110 Omnifit Sicomet 7000	Clear	Instant adhesive for bonding rubber, metal and plastics; general purpose. For gaps up to 0.15 mm (0.006") Read caution instructions before using. Temp. range, -54 to 82°C (-65 to 180°F)	52676 - 1 oz.

Threadlockers and Sealants

TYPE ( ) = Europe	COLOR	USAGE	PART NO. - SIZE
Loctite Primer T Hernon Primer 10 Omnifit VC Activator	Aerosol Spray	Fast curing primer for threadlocking, retaining and sealing compounds. Must be used with stainless steel hardware. Recommended for use with gasket sealants.	2006124 - 6 oz.

Torque Values

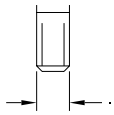
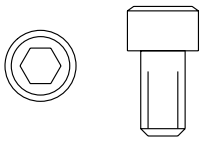
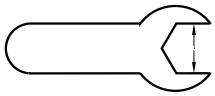
Metric Fasteners (DIN)

	TORQUE VALUES (Based on Bolt Size and Hardness)						**WRENCH SIZE**			
	 8.8		 10.9		 12.9					
Size	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**Inch**	**Metric**	**Inch**	**Metric**
M3	*11	1.2	*14	1.6	*19	2.1	7/32	5.5	-	2.5
M4	*26	2.9	*36	4.1	*43	4.9	9/32	7	-	3
M5	*53	6.0	6	8.5	7	10	5/16	8	-	4
M6	7	10	10	14	13	17	-	10	-	5
M8	18	25	26	35	30	41	1/2	13	-	6
M10	36	49	51	69	61	83	11/16	17	-	8
M12	63	86	88	120	107	145	3/4	19	-	10
M14	99	135	140	190	169	230	7/8	22	-	12
M16	155	210	217	295	262	355	15/16	24	-	14
M18	214	290	298	405	357	485	1-1/16	27	-	14
M20	302	410	427	580	508	690	1-1/4	30	-	17

1 **ft.lb.** = 1.357 Nm. * = in.lb. 1 Inch = 25.4 mm

Torque Values

Inch Fasteners (SAE)

										
Size	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**ft.lb.**	**Nm**	**Inch**	**Metric**	**Inch**	**Metric**
No.4	*6	0.7	*14	1.0	*12	1.4	1/4	5.5	3/32	-
No.6	*12	1.4	*17	1.9	*21	2.4	5/16	8	7/64	-
No.8	*22	2.5	*31	3.5	*42	4.7	11/32	9	9/64	-
No.10	*32	3.6	*45	5.1	*60	6.8	3/8	-	5/32	-
1/4	6	8.1	9	12	12	16	7/16	-	3/32	-
5/16	13	18	19	26	24	33	1/2	13	1/4	-
3/8	23	31	33	45	43	58	9/16	-	5/16	-
7/16	37	50	52	71	69	94	5/8	16	3/8	-
1/2	57	77	80	109	105	142	3/4	19	3/8	-
9/16	82	111	115	156	158	214	13/16	-	-	-
5/8	112	152	159	216	195	265	15/16	24	1/2	-
3/4	200	271	282	383	353	479	1-1/8	-	5/8	-

1 ft.lb. = 1.357 Nm. * = in.lb. 1 Inch = 25.4 mm

Wacker Construction Equipment AG · Preußenstraße 41 · D-80809 München · Tel.: +49-(0)89-354 02 - 0 · Fax: +49 - (0)89-354 02-390
Wacker Corporation · P.O. Box 9007 · Menomonee Falls, WI 53052-9007 · Tel. : +1-(1)(262) 255-0500 · Fax: +1-(1)(262) 255-0550 · Tel. : (800) 770-0957
Wacker Asia Pacific Operations · Sunley Center, Unit 912, 9/F · 9 Wing Qin Street, Kwai Chung, N.T. · Hong Kong · Tel. + 852 2406 60 32 · Fax: + 852 2406 60 21